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RAIL OUTLOADING CAPABILITY STUDY, FORT POLK, LOUISIANA,(U)
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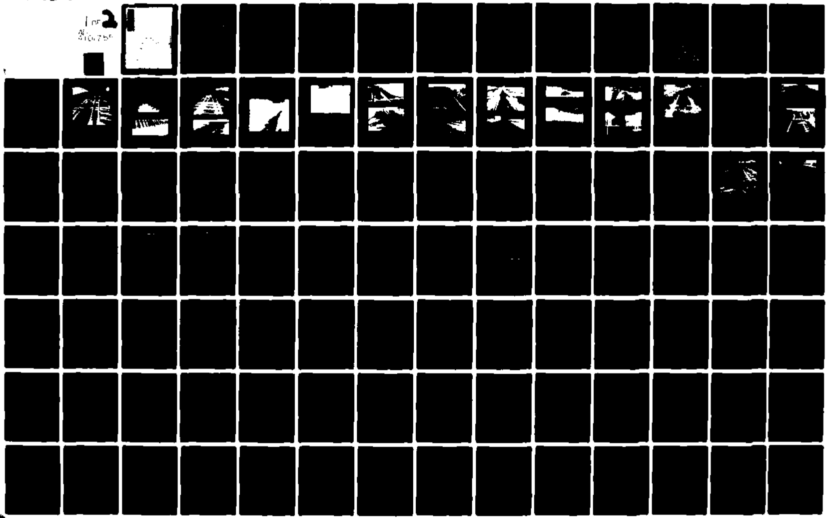

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MTMC REPORT TE 7T-18

RAIL OUTLOADING CAPABILITY STUDY

FORT POLK, LOUISIANA

June 1977

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MILITARY TRAFFIC MANAGEMENT COMMAND

TRANSPORTATION ENGINEERING AGENCY

Newport News, Virginia 23606

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EXECUTIVE SUMMARY

1. SCOPE

At the request of FORSCOM, the Military Traffic Management Command (MTMC) completed a field survey of the rail facilities at Fort Polk, Louisiana, to determine the station's outloading capability. The field survey was conducted 3 through 7 October 1976. Rail facilities within 25 miles of the installation were included in the survey.

2. FINDINGS

The primary finding at Fort Polk was that its rail system outloading capability can support only small-scale operations at present. The condition of the railroad tracks varies from good to unusable, and outloading plans, blocking and bracing materials, and other necessary elements are lacking. If these elements were available, current capability would be 64 railcars per day.

Since outloading plans have not been developed, transportation officials at Fort Polk requested that the analysis consider railcar outloading rates that would produce 750 railcar loads in 7 days for nonroadable equipment. Due to the configuration of the rail system, the closest figure to the desired range that can be feasibly achieved by upgrading the system, as determined by the analysis, is 129 railcars per 24-hour day or 774 railcar loads in 6 days, using 50-foot car lengths. This would allow 1 day in 7 for inclement weather. Other options producing from 64 to 254 railcars per day were considered and are presented in this report.

The Kansas City Southern (KCS) agent at Leesville assisted in determining the extent and capability of their facilities within 25 miles of Fort Polk. The survey revealed that the KCS yard at Leesville should be used for classifying railcars destined for Fort Polk, and that, although available trackage is adequate for storing railcars to support outloading operations, outloading facilities in the area are unsuitable for volume outloading of military equipment.

The roadway system on the installation is adequate to accommodate the largest highway vehicles. Gate access to State Route 171, a dual highway that serves the installation, is by one at-grade interchange, and the highway system in the area is adequate. Therefore, neither access to the highway system nor the system itself restrains movement of roadable military vehicles.

3. CONCLUSIONS

a. The condition of the railroad tracks at Fort Polk varies from good to unusable; however, current rail outloading capability is limited severely by lack of necessary supporting elements, such as outloading plans and blocking and bracing materials.

b. Due to Fort Polk's proximity to ocean terminals on the gulf coast, only nonroadable equipment would have to be outloaded by rail for gulf coast ports of embarkation (POEs). Necessary supplies for outloading nonroadable equipment should be stocked.

c. Estimate of minimal cost to perform the work necessary to the rail system to achieve an outloading rate of 129 railcars per 24-hour day is $327,800. Attainment of a maximum outloading rate of 254 railcars per day will cost $380,100. At these rates, the nonroadable equipment of the 5th Division, stationed at Fort Polk, Could be outloaded by rail in approximately 6 and 3 days, respectively, after receipt of sufficient railcars to permit full-scale operations (requirement - 750 DODX and commercial railcars loaded at Fort Polk)[1/].

d. Physical improvements to the rail system and other necessities for outloading (sec II, para D4) should be implemented to coincide with full activation of the division.

e. The KCS railroad yard at Leesville should be used for classifying incoming empty railcars destined for Fort Polk.

f. The KCS has adequate railcar storage capacity to support a volume outloading of Fort Polk's units.

g. The KCS trackage in the vicinity of Fort Polk is in generally good condition.

h. The KCS agent at Leesville believes that the KCS can handle the outloading of Fort Polk units concurrently with other demands.

i. Fort Polk transportation personnel should coordinate planning of impending outloading operations with the KCS at the earliest possible date.

[1/] 5th Infantry Division Transportation Office.

4. RECOMMENDATIONS

a. Undertake those items listed in section II, paragraph D4 (Recommended Improvements and Additions). These improvements will provide a rail system capability of 129 railcars per day.

b. Prepare a detailed unit outloading plan, using the simulation in Appendix B as an example, that specifies unit assignments at loadout sites and movement functions.

c. Coordinate rail outloading plans with the KCS at the earliest possible date.

d. Initiate and/or continue facility maintenance to insure [illegible]ti[illegible]ed effectiveness of the improved rail system.

e. Provide periodic training for blocking and bracing crews.

f. Use the KCS yard at Leesville to classify incoming empty railcars.

I. INTRODUCTION

In July 1976, a request from FORSCOM for a rail outloading capability study of Fort Polk, Louisiana, was received by MTMC. The principal objective of the study was to determine Fort Polk's capability to support the deployment of the 5th Infantry Division and deployable units of the United States Strategic Army Forces. The scope of the study was to include also any physical improvements that could significantly increase present capabilities of Fort Polk, as well as consideration of commercial facilities within 25 miles of the post. The main entrance to Fort Polk is on US Highway 171, approximately 3 miles south of Leesville, Louisiana (Figure 1).

To fulfill this request, an onsite survey was conducted at Fort Polk, 3 through 7 October 1976, by a MTMC engineer. The major findings of the survey and the ensuing analysis are that the existing usable rail trackage and facilities will support a maximum outloading rate of approximately 64 flatcars per 24-hour day. However, Fort Polk's outloading capability is restricted severely by lack of outloading plans, materials, and other essential elements. Physical improvements -- such as rehabilitation of tracks, installation of lighting, and construction of end-ramps -- and the other needed elements could provide an outloading capability of up to 254 railcar loads per 24-hour day. Commercial rail facilities within 25 miles of Fort Polk were found to be in generally fair condition; however, at present, none are suitable for volume outloading of equipment.

Findings and recommendations contained in this report are based on analysis of date obtained during the field study and other pertinent information relating to Fort Polk activities at that time. Problems incurred during implementation of the recommendations should be referred to MTMCTEA for resolution.

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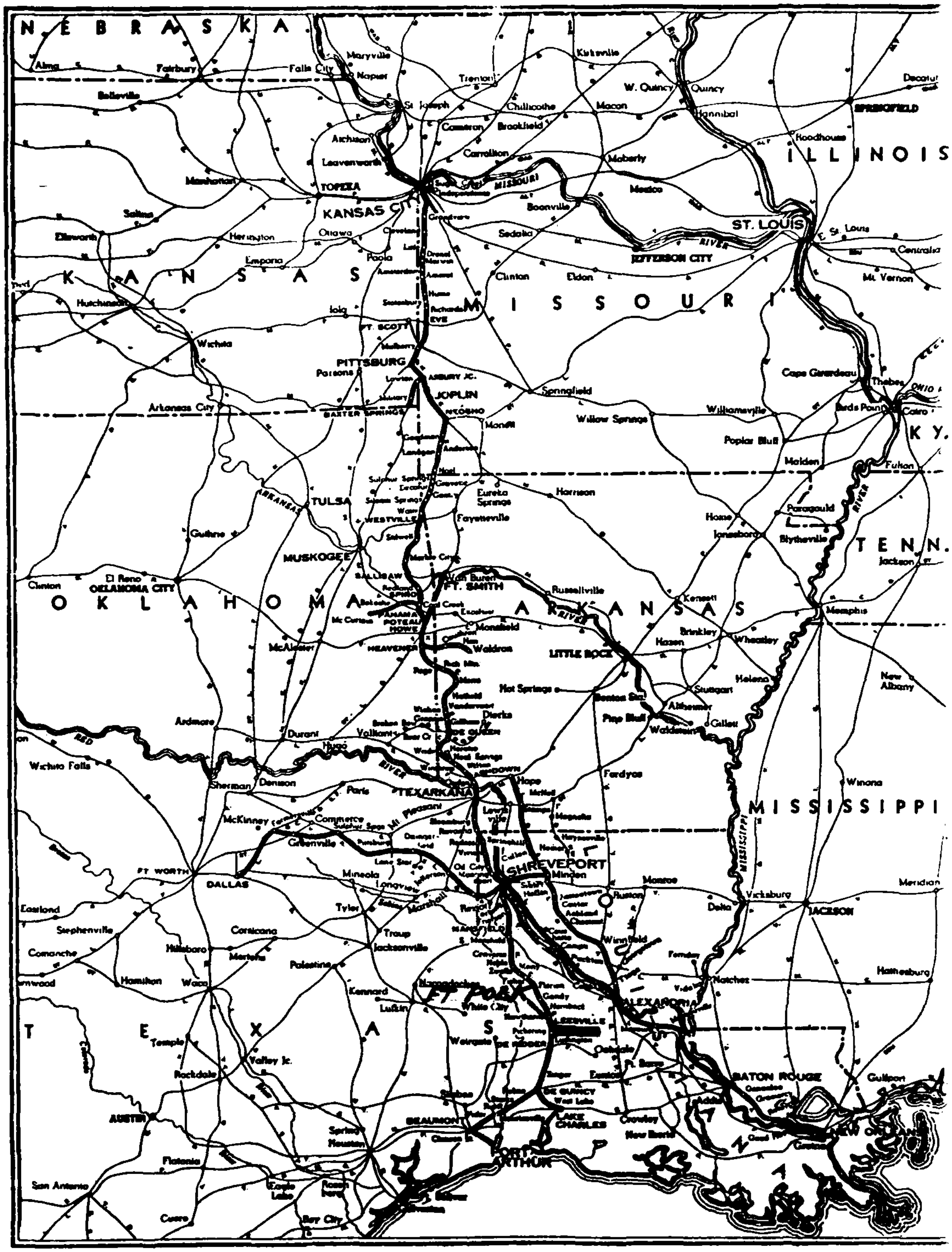

Figure 1. Fort Polk, Louisiana, Located Near the Main Line of the Kansas City Southern Railroad, South of Leesville.

II. ANALYSIS OF FORT POLK'S RAIL OUTLOADING FACILITIES

A. GENERAL

Discussions with personnel of the Transportation Office and the 5th Division at Fort Polk and meetings with officials of the Kansas City Southern Railroad concerning rail outloading revealed that large-scale rail operations have not occurred at the post in recent years. The post has concentrated on basic training activities, which, by their nature, require little ability to move organized units. Consequently, some of the information furnished by them was notional, based upon varied experience and judgment. Factual data about locomotive operating times and blocking and bracing capabilities were gathered from other studies.

B. RAIL FACILITY DESCRIPTION

The Fort Polk rail system is illustrated in Figure 2 and described in Table I. The survey of all possible sites that could be used for outloading equipment revealed that only three sites are currently usable for end-loading vehicles, and that eight other sites have potential, but are either currently unusable or have other deficiencies as noted in Table I. The following discussion begins with the northernmost spurs on the installation, where the post main line enters and proceeds south through the installation to the south main track.

The post exchange spur and contractor's spur are currently unusable. The post exchange spur is so short that it is of no practical value, and access to the end is blocked by a warehouse (Figure 3).

While the contractor spur has potential as a possible site, the area has been leased to a contractor and is not in an acceptable condition. Considerable improvement, such as grading and surfacing, would be required to place this track in service (Figures 4 and 5). Neither of these sites has lighting.

The property disposal office (PDO) spur is usable, but has no end-loading ramp, the end of the track is inaccessible since the area is used to store disposable property, access along the track is very limited, and the track has no lighting (Figure 6).

The north main track is currently used as an unloading site for ammunition. This track is usable and vehicles could be end loaded over a portable ramp (Figure 7). However, except for the north end

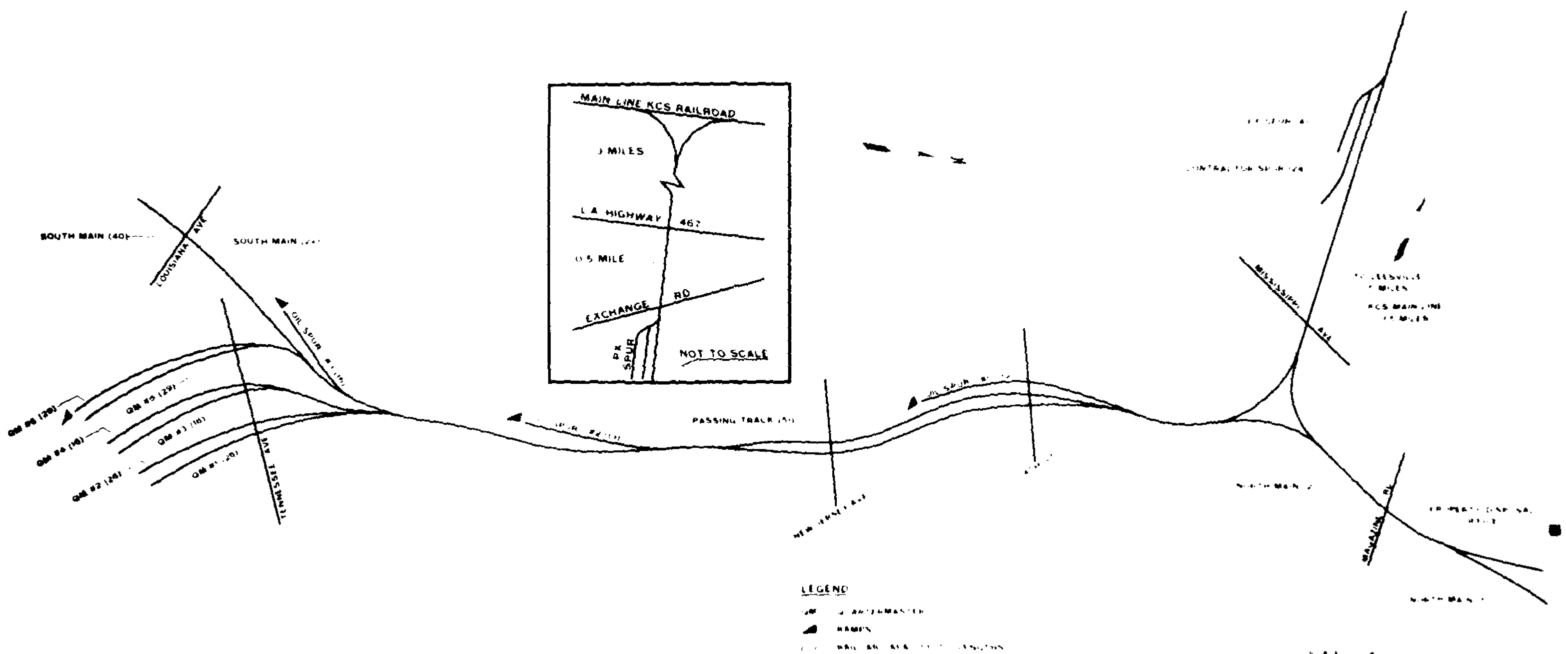

Figure 2. Fort Polk Rail System.

TABLE I
RAIL OUTLOADING FACILITIES ON THE INSTALLATION

Track and Figure No.	End Ramp	Lighting	Surface Conditions	Staging Area	Railcar Capacity (50-foot Lengths)	Access Availability	Present Condition of Track
Ex Spur Figure 3	No	No	Poor	No	4	Poor	Unusable. Overgrown with weeds; end covered with soil.
Contractor's Spur Figures 3, 4, and 5	No	No	Poor	Yes	24	Good	Unusable. End of track covered with soil. Ballast washed away from ties in several places.
PDO Spur Figure 6	No	No	Good Paved	Yes Large, paved, but used for salvaged equipment	14	Good Except along sides of track	Usable, poor condition, needs maintenance.
North Main Figures 7, 8, and 9	No	No	Good at 200 ft x 75 ft hardstand at north end, but poor along the rest of the track	Yes	21	Good	Usable, but needs maintenance. Some work in progress during survey.
Oil Spur 1 Figures 10 and 11	Yes Concrete	No	Poor	Yes Large adjacent area	39	Good Except rough	Unusable. Overgrown with weeds. Part covered with soil.
Passing Track Figure 12	N/A	Some across street	Good	Yes Large adjacent area	51	Good	Usable.
Oil Spur 2 Figure 13	Yes Concrete	Some, but inadequate	Good	Yes Large adjacent area	19	Good	Good condition.
Oil Spur 3 Figures 14 and 15	Yes Concrete	No	Good	Yes	16	Good	Usable, but poor condition. Poor drainage.
QM 1 and 2 Figure 16	No	No	Good	Yes	26 Each	Good at ends	Generally good condition.
QM 3 and 4 Figure 17	No	No	Poor	Yes	16 Each	Good at ends	Poor condition. Needs maintenance.
QM 5 and 6 Figures 18 and 19	5 - No 6 - Yes Concrete	No	Good	Yes	29 Each	Fair Must turn to enter ramp	Generally good condition, except for weed control.
South Main Figure 20	No	No	Good	Yes	22	Good	Poor. Overgrown with weeds; partially covered with soil.
Post Main Line	N/A	N/A	Generally Good	N/A	N/A	N/A	All usable, but varies from very good condition to poor, requiring maintenance.

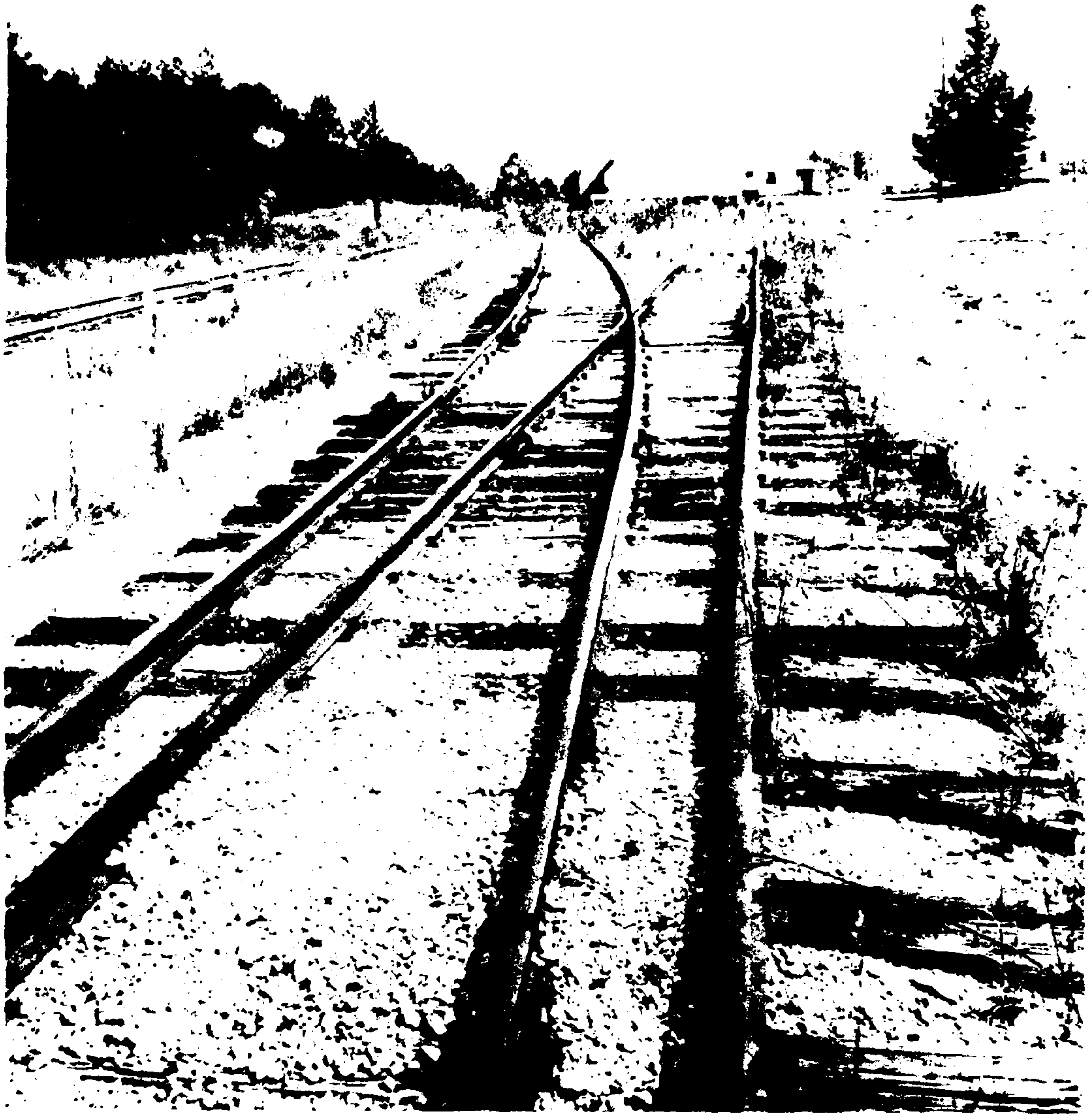

Figure 3. Post Exchange Spur to the Right, Contractor's Spur to the Left, Unusable.

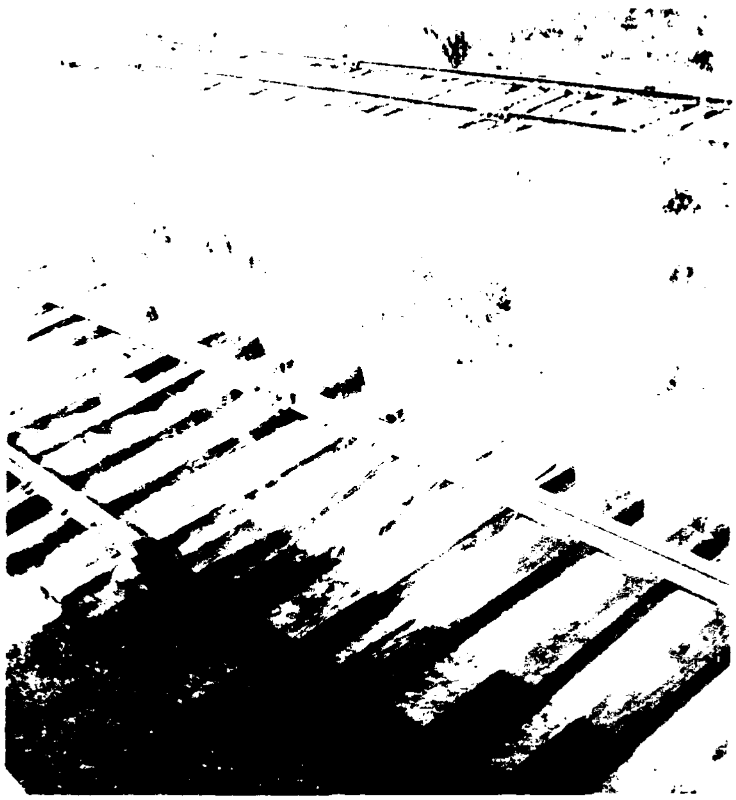

Figure 4. Contractor's Spur - Ballast Washed Away From Ties.

Figure 5. Contractor's Spur Lacks Ballast, and has Deteriorated Ties.

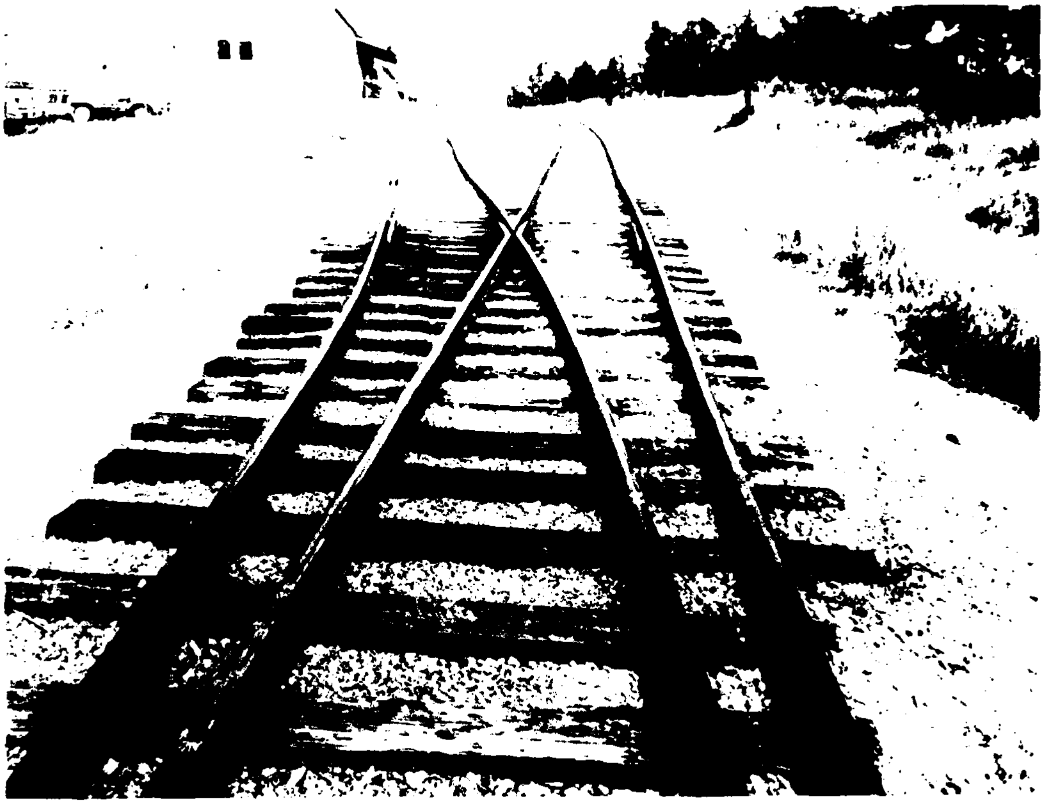

Figure 6. Property Disposal Office Spur to Left, North Main to Right.

Figure 7. North End of North Main Track, Ammunition Unloading Site.

of the track, access along the sides is very limited and would hamper an outloading operation.

Deep drainage ditches on both sides of the track (Figures 8 and 9) extend from the small hardstand to the PDO spur, a distance of approximately 2,000 feet. Also the soil is very silty and would be unstable during wet weather. These conditions make it costly to improve the area adjacent to the tracks to provide working space and even a minimum-width road for support vehicles delivering materials. Other tracks can be rehabilitated at less cost.

Figure 8. Drainage Ditch Along North Main Track, East Side.

Figure 9. Drainage Ditch Along North Main Track, West Side.

Oil spurs 1, 2, and 3 are equipped with concrete end-loading ramps and are overall the best outloading sites. Currently, only spurs 2 and 3 are usable, and none has lighting (Figures 10 through 15).

The Quartermaster (QM) warehouse tracks consist of six parallel tracks; QM 1 and 2 and 5 and 6 are in good condition, but QM 3 and 4 are in poor condition. QM 6 has a concrete end-loading ramp. QM 1 and 3 or QM 2 and 4 have potential as loadout sites if equipped with end-loading ramps. The track adjacent to each of the pairs must be left open to provide access alongside the railcars for delivery of materials and for blocking and tiedowns. None of these tracks have lighting (Figures 16 through 19).

The last potential outloading site is the south main track, for which an end-loading ramp could be provided (Figure 20). Heavy traffic on Louisiana Avenue, plus the limited area at the extreme end of the track, suggests that a better improvement would be to cut the south

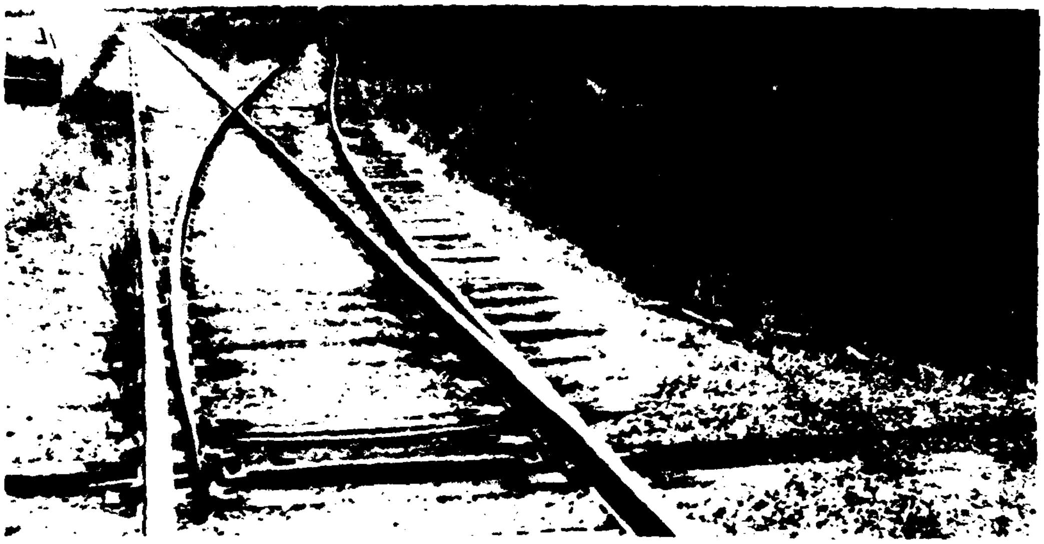

Figure 10. Oil Spur 1 to Right, Post Main Line to Left.

Figure 11. Ramp End of Oil Spur 1.

Figure 12. North End of Passing Track, South of Switch to Oil Spur 1.

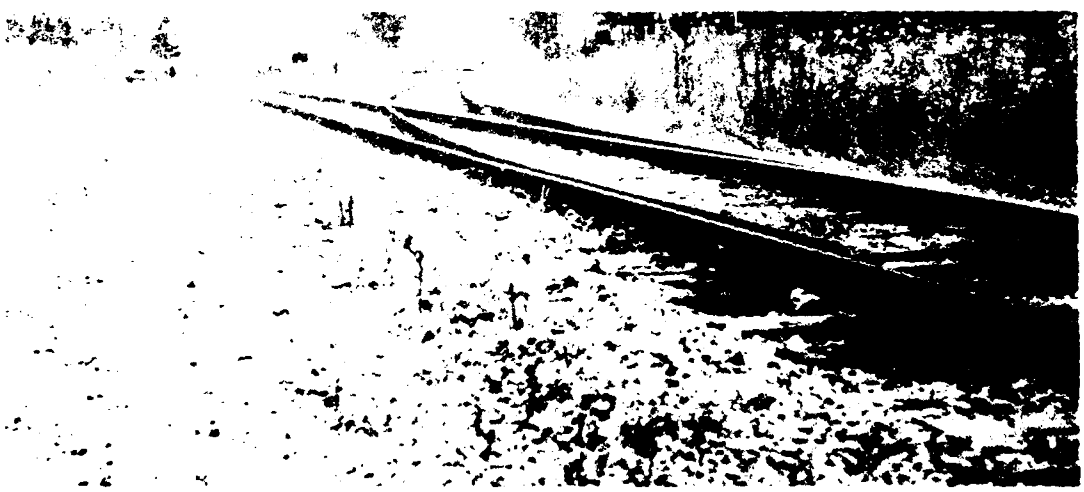

Figure 13. Oil Spur 2 to Right, Post Main Line to Left.

Figure 14. Oil Spur 3.

Figure 15. Oil Spur 3, Access to Ramp (Looking North).

Figure 16. Quartermaster Warehouse Tracks 1 and 2.

Figure 17. Quartermaster Warehouse Tracks 3 and 4.

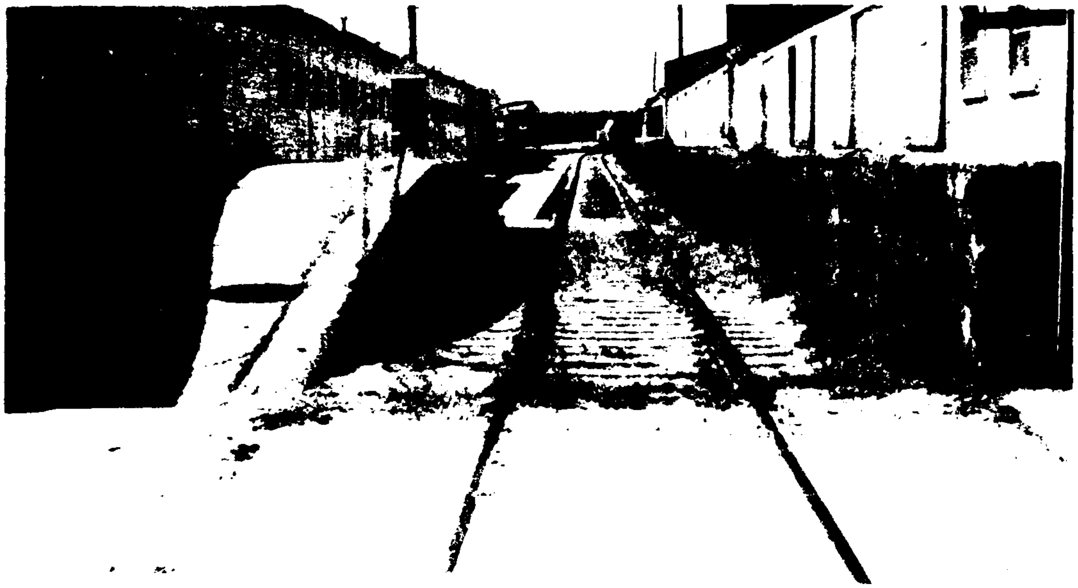

Figure 18. Quartermaster Warehouse Tracks 5 and 6.

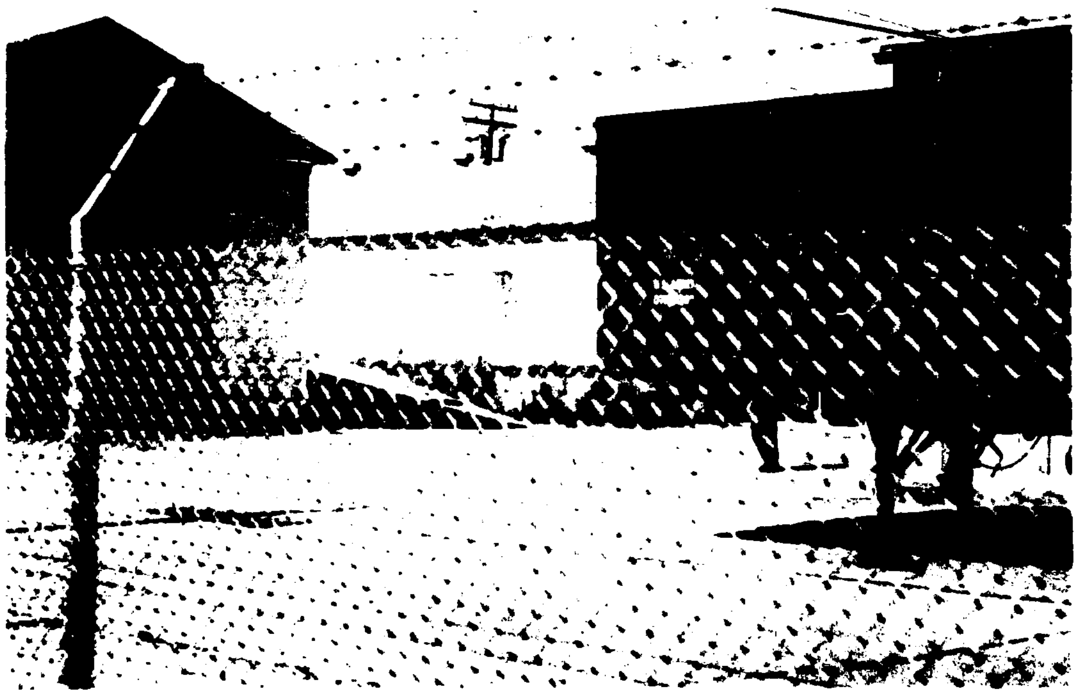

Figure 19. Approach to Ramp at QM 6, Toe of Ramp Near Center of Photograph.

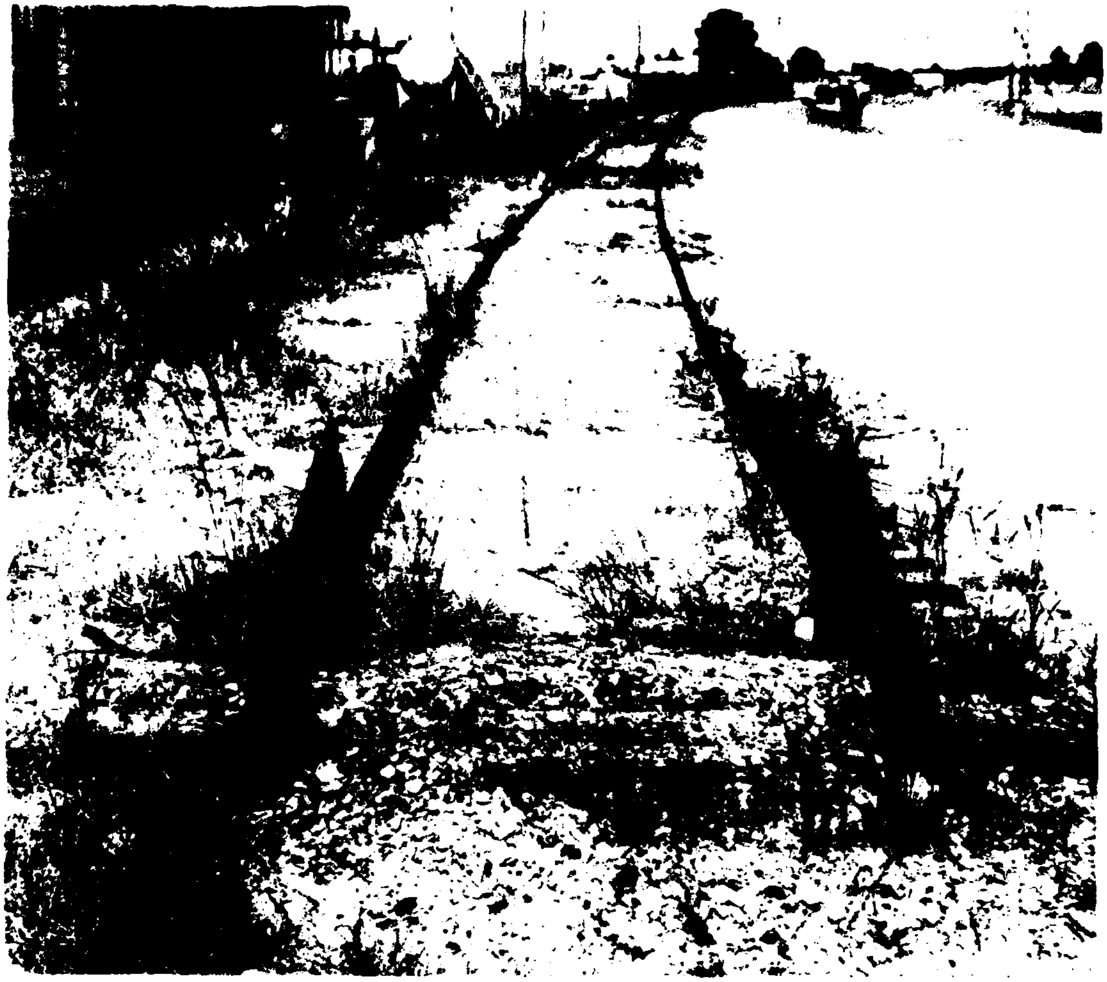

Figure 20. South Main.

main track at a point approximately 100 feet north of Louisiana Avenue, install an end-loading ramp at that point, and abandon the track south of this new location. The new end of the south main ramp would appear on the track illustrated in Figure 15 (right side). While this is considered a potential outloading site, it is not recommended, because of its location; it would create extreme congestion in the vicinity of oil spur 3 and at the intersection of Louisiana and Texas Avenues.

The passing track that parallels Texas Avenue could be used for loading vehicles with the use of portable end ramps; however, this track should be kept open for its functional use and for unforeseen contingencies, such as defective or surplus railcars (see Figure 12).

The main line track varies from good to poor (Figure 21), but its entire length is usable. Perhaps the worst deficiencies are the inoperable switch and missing rails at the north end of the "Y" (Figure 22); these will have to be repaired to facilitate turning movements in outloading operations.

The access to Fort Polk's rail system is good. Vehicles from motor pools and equipment from storage areas can be routed along good asphalt roads to any of the loadout sites. This fact, coupled with the potential of the rail system, indicates that Fort Polk can develop a transportation system and procedures for outloading the division.

C. CURRENT PROCEDURES

Since the 5th Division is still in the formative stage, outloading procedures have not been developed as yet. The Kansas City Southern Railroad serves Fort Polk and performs the internal switching of railcars; however, most incoming supplies are delivered by truck, and rail operations are minimal. Only four railcars were on the installation during the study period, 3 through 7 October 1976. Plans have been made to train blocking and bracing crews; however, training has not been initiated, and blocking and bracing materials are not currently available. Also, the post mission has changed from that of supporting basic training to that of an active division base, as a result of the formation of the 5th Division. Planning and preparations for outloading the division should be pursued until acceptable arrangements have been completed.

When railcars are received, several sites handle different types of cargo, as follows:

1. The north main track is not in a congested area and is near the magazines; therefore, it is used to unload ammunition.

2. The QM warehouse tracks serve the warehouses, with most activity at the commissary.

3. Oil spur 3 is the primary vehicle outloading site.

D. RAIL SYSTEM ANALYSIS

1. Current Outloading Capability

The potential capability of Fort Polk's rail system is much greater than its current capability. At present, three loadout sites can be operated in daytime only, for a total output of 64

Figure 21. Post Main Line Connection to KCS Main Line Track, Very Good Condition at LA Highway 467.

Figure 22. Inoperable Switch and Missing Rails at North End of "Y," East Leg of "Y" Unusable.

railcars per day. No lighting exists for nighttime loading or blocking and bracing operations. The post has only four permanent end-loading ramps, which are located at: oil spur 1 (OS-1), oil spur 2 (OS-2), oil spur 3 (OS-3), and quartermaster 6 (QM-6). However, OS-1 is unavailable presently because track is unusable. Therefore, current operations can be conducted only at OS-2, OS-3, and QM-6. The current capability may be increased greatly by loading railcars on OS-2 out onto the post main line, all the way to New Jersey Avenue. The capacity of OS-2 would then be increased from 19 to 47 railcars, which would increase the rail output from 64 to 92 railcars per day. The disadvantage of this rail loading plan is that one end of the passing track and of the post main line is blocked while the railcars are in the loading position. This loading plan (Plan 2) is not recommended, but is included in the analysis in case post officials consider the blocked line less important than attaining an output of 92 railcars per day.

2. Rail Outloading Analysis

A complex system structure can be viewed as a series of interconnected subsystems. The limiting subsystem within the system establishes the maximum outloading capability. Therefore, in ascertaining the maximum rail outloading capability at Fort Polk, the following subsystem separation was used:

a. Commercial Service Capabilities

Commercial service capabilities present no problem to Fort Polk. The common carrier serving the post is the KCS, and its operations in the vicinity of Fort Polk are well organized. The local railroad agent in the Fort Polk district is confident that they can fulfill any task required of them, and a survey of the facilities and equipment confirmed his optimism. Leesville yard has nine parallel tracks that can be used for classification and railcar storage. Additional railcar storage exists at Ludington and at other sites very close to Fort Polk. All of the KCS facilities within 25 miles of the post were in generally good condition. The KCS has purchased 10 new locomotives and is upgrading its yards and tracks. Post Transportation personnel should coordinate their future operation plans with the KCS as soon as practicable.

b. Moving to and Loading on Railcars at a Particular Site

The movement of cargo to loading sites is relatively quick and efficient since most of the equipment is self-propelled, and access is along good paved roads. Traffic patterns and traffic control would have to be set up, but such measures should be standard for full-scale outloading operations. Staging areas are adequate and any necessary queuing should create no problem. Observations during loading operations revealed that vehicles move along the flatcars at an average speed of 1 mile per hour, with only one vehicle moving on a railcar at any one time. The longest string of empty flatcars used by the recommended outloading plan, assuming 50-foot car lengths, was 39 cars, the length of OS-1. Using that figure, the first vehicle would reach the end of the last car 22 minutes after driving up the ramp. Circus style of driving vehicles on flatcars depends on the use of bridge plates spanning the gap between the cars. According to the plan employed in our analysis, no fewer than 124 sets of bridge plates are required. This is because the outloading cycle time is insufficient to permit rotation of the bridge plates between sites. However, if 2 hours were added to the outloading cycle time, the required number of bridge plates could be reduced to 66. This would mean that, when loading is completed at OS-1 and QM-6, 58 sets of plates must be picked up and distributed to the other three sites for their use. The total number of railcars on the other sites is 61; therefore, rotating the 58 sets of plates between the sites can be considered adequate only if a crew is tasked with that specific assignment. To prevent delays, the crew must be able to complete the rotation in about 2 hours, but that should be no problem.

Assuming the bridge plates are in place, a hypothetical load of two 2-1/2-ton trucks per flatcar can be simulated. The first truck would reach the end of the 26 flatcars on QM-1 in 15 minutes. This loading time is not significant when compared with blocking and bracing time. Therefore, if 58 sets of bridge plates are available, moving and loading on the railcars is not the limiting subsystem.

c. Blocking, Bracing, and Safety Inspections

Blocking, bracing, and safety inspection times are difficult to project. They depend on a wide variety of variables such as:

(1) Crew size and experience.

(2) Extent of the safety inspection.

(3) Documentation.

(4) Availability of blocking and bracing material and materials-handling equipment (MHE).

The establishment of a 5- to 7-hour time limit for loading, blocking, and bracing at a loading site, as a reasonable goal for crews, was based on experience and actual field tests of circus-style loadings. Discussion with the blocking and bracing instructors has indicated that there should be no more than eight men per crew, regardless of experience, to avoid wasted man-hours.

The main problem at Fort Polk is that no blocking and bracing material stockpile exists and no instruction or training for blocking and bracing crews has been initiated. Without these capabilities, no operation can even get under way. Even when the material and training needs are taken care of, inadequate lighting will prevent blocking and bracing during night operations. Therefore, blocking and bracing deficiencies are the real constraint to the rail outloading system at present.

d. Interchange of Empty and Loaded Railcars

An efficient interchange of empty and loaded railcars requires careful planning and good coordination with the common carrier. This can be established at Fort Polk because the KCS main line passes within about 3 miles of the post. The post main line, west of Georgia Avenue, can be used for the storage of loaded railcars awaiting pickup by KCS road locomotives. With Leesville only a few miles away, availability of a KCS locomotive and crew should present no problem. Leesville has a 400-car storage yard; this means that the required number of empty cars, which is essential to maintain the operation, should be obtainable each day if sufficient advance notice is given.

The various plans for spotting railcars depend on the type of operation. A place or location must be provided for railcars (1) in empty storage, (2) in loaded storage, and (3) at the loading sites. There may be three or possibly only two

balanced areas, or there may be only one area used on the post, with the other two areas off post. In the case of one on post area, loading takes place at all available sites. In general, there are three balanced or equally divided areas somewhere in the vicinity.

This subsystem has several variations. If the loading sites double for the loaded storage area, the rail system can be considered to have two balanced areas. An equal number of spaces would be in the empty storage and in the loading sites. This would be the case also if the loaded cars, after being loaded, were stored on the main line track that provides service to the installation. Now, if the empty railcars can be stored in a nearby yard owned by the common carrier and can be delivered to the post each day as needed, then only one on-post area is needed -- the loading sites. The advantage of a scheme with only loading sites on post is obvious; the outloading rate is much greater because all available on-post spaces are used for loading. However, the disadvantage of locating the empty storage off post is that extra care must be given to the planning to insure that the empty cars arrive on schedule at the loading sites. Thus, if the interchange of railcars follows the organization presented in the simulation (Appendix B), this subsystem will not limit the capabilities of Fort Polk's rail outloading operations.

e. Summary

Considering all the subsystems together, blocking, bracing, bridge plate supply, and planning and control emerge as the primary factors restraining any large rail outloading operation at Fort Polk. Therefore, elimination of the deficiencies in these areas is the major prerequisite for a successful operation. When they have been eliminated, the resulting capability should be compared with movement contingency plans.

The level of operation to satisfy the installation's needs, as established by transportation officials, is approximately 110 railcars per day. However, when actions discussed herein have been taken -- with regard to area lighting, ramps, MHE, blocking and bracing capabilities, and planning and coordination for the full operation of all current loadout sites -- Fort Polk can outload as many as 254 railcars per day. Of course, if incoming railcars block tracks that are

scheduled for outloading, the maximum capability could be reduced significantly.

Another aspect that affects station outloading at Fort Polk is the destination of the unit material after it leaves the installation. The most likely ports of embarkation for the 5th Division are on the gulf coast, 4 to 5 hours travel by freight train. This means that a majority of the 5th Division's equipment could be driven to their POE without external transportation support. This also reduces the demand on the installation rail system and further demonstrates its adequacy for most likely POEs; however, an all-rail move to a west coast POE would require a maximum effort, with consequent higher outloading rates. Thus, Fort Polk's rail system, with the common carrier servicing it, has the potential for supporting the deployment of the 5th Division and STRAF units in a timely manner. The existence of capability at any one time, however, will depend on how many supporting deficiencies have been eliminated.

3. Rail System Outloading Options

The various options for the outloading plans are shown in Figure 23. Eight plans are given for daylight-only loading, plans 1 through 8, and four plans are given for around-the-clock operations. The latter four plans, A, B, C, and D, are divided into two parts. Plans A and B were developed using three balanced areas: loading sites, empty storage, and loaded storage of equal track lengths. Plans C and D were developed for only two balanced areas: loading sites and empty storage. Of course, the loaded storage must be somewhere, and in this case, the loading sites provide also the loaded storage. The two balanced areas approach is possible because of the short distance to Leesville, where empty railcars can be accumulated for the next day, and of the fact that the main line locomotives can go onto the post and perform switching operations for train makeup. Therefore, through proper planning, main line locomotives can be be waiting on post to begin coupling loaded cars as soon as the blocking and bracing inspection is finished. Using this procedure, the storage area for loaded cars is not necessary; thus, loading sites as well as the daily output of railcars are increased.

The procedure for using only two balanced areas works according to the following sequence: the main line locomotive leaves the post with the loaded cars; another locomotive brings in the

	RAILCAR CAPACITY	CURRENT		MAINTAINED									
		PLAN 1 64 RCPD	PLAN 2 92 RCPD	PLAN 3 90 RCPD	PLAN 4 129 RCPD	PLAN 5 145 RCPD	PLAN 6 167 RCPD	PLAN 7 190 RCPD	PLAN 8 225 RCPD	PLAN A 168 RCPD	PLAN B 128 RCPD	PLAN C 254 RCPD	PLAN D 176 RCPD
RAIL SYSTEM MAINT 1/				276,600	276,600	276,600	276,600	276,600	276,600	276,600	276,600	276,600	276,600
OIL SPURS:													
OS-1	39				9,500	9,500	9,500	9,500	9,500	9,500		9,500	
OS-2	19	✓		4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200	4,200
OS-2 2/	47		✓										
OS-3	16	✓	✓	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000
QUARTERMASTER SPURS:													
QM-1	26			1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650	1,650
QM-2	26									1,650	1,650	1,650	1,650
QM-3	16					4,900	4,900	4,900	4,900	4,900	4,900	4,900	4,900
QM-4	16									4,900	4,900	4,900	4,900
QM-5	29												
QM-6	29	✓	✓	8,350	8,350	8,350	8,350	8,350	8,350	8,350	8,350	8,350	8,350
SOUTH MAIN	24						✓	✓	✓	✓	✓	✓	✓
NORTH MAIN	21							✓	✓	✓	✓	✓	✓
PASSING TRACK	35								✓				
NORTH MAIN "WYE"									8,000				
LIGHTS:													
OS-1	29											11,950	
OS-1	20									6,120			
OS-2	19									5,800	5,800	5,800	5,800
OS-3	16									5,200	5,200	5,200	5,200
QM-6	29									9,800	9,800	9,800	9,800
SOUTH MAIN	24											8,100	8,100
RAMPS:													
QM-1	26			1,500	1,500	1,500	1,500	1,500	1,500				
QM-3	16					1,500	1,500	1,500	1,500				
SOUTH MAIN	24						1,500	1,500	1,500			1,500	1,500
NORTH MAIN	21							1,500	1,500				
PASSING TRACK	35								1,500				
TOTAL COST IN DOLLARS		—	—	318,300	327,600	334,200	335,700	337,200	346,700	364,670	349,050	380,100	350,650

1/ RAIL SYSTEM MAINTENANCE CONSISTS OF REPAIR THAT MUST BE DONE ON THE PART OF THE RAIL SYSTEM THAT SERVICES ALL SPURS (PASSING TRACK $8,600) (NORTH MAIN WYE - $8,000) (POST $164,000) (LINE FROM KCS TO POST - $75,000) (NORTH MAIN - $21,000)

2/ OS 2 IS LOADED OUT ONTO THE MAIN.

NOTE: RCPD - RAILCARS PER DAY

Figure 23. Fort Polk Rail System Outloading Options.

empties from the storage yard in Leesville. Meanwhile, switching locomotives on post move the empties already on post from empty storage to the loading sites. Then the main line locomotive places the empty railcars in the empty storage area. The switching sequence for Plans A, B, C, and D are shown in Appendix B.

Plans 1 and 2 are described in section II, paragraph D1 (Current Outloading Capability). Plan 3 has the addition of a portable ramp at QM-1. Plan 4 has the addition of spur OS-1. Plan 5 has the addition of a portable ramp at QM-3. Plan 6 has the addition of a portable ramp at the end of the south main track, which should be placed on the north side of Louisiana Avenue so as not to block that busy street. Plan 7 has the addition of a portable ramp along north main on the south side of Magazine Road so as not to block traffic on Magazine Road. Since the northern end of north main is its only terminus, it is not suited for outloading operations. This section of track should be used only for outloading operations as an absolute necessity. Ammunition is currently unloaded on a small scale at this section of track due to the remote location, and it can still be unloaded at this location simply by moving the portable ramp while exchanging empty and loaded cars at this site. Since the ammunition unloading is infrequent, this plan can be accomplished easily. Plan 8 has the addition of a portable ramp on the passing track. The ramp is located adjacent to the north side of New Jersey Avenue, with the loading string extending only as far as 4th Street so as not to block traffic. Furthermore, the "Y" at north main must be repaired for use of the locomotives to switch ends with the cars when either empties are brought in or loaded cars are taken out. Of course, this plan is the least desirable one.

The recommended plan, Plan 4, along with Plans 1 through 8, is shown in detail in Appendix B. The switching sequence for Plan 4 is shown in a time chart. The general sequence of operations for Plan 4 is as follows:

> Main line engines go on the installation and pick up 129 loaded cars, which are moved to their destination. Immediately following this, 129 empty cars are moved onto the installation along the main line at the passing track. (Incoming empty cars are classified at Leesville as to type, length, and height prior to delivery to Fort Polk.) A 130-ton switching engine that is on the installation picks up the empties and spots them at the various sidings. During the period 0700 to 1400

hours, equipment is loaded, blocked and braced, and inspected; and the 24-hour cycle begins again, with the loaded cars being picked up at approximately 1400 hours. Note that all switching operations are performed during afternoon and evening hours, and the total available time is 17 hours.

4. Recommended Improvements and Additions

a. Items listed below are all minimum requirements to provide the recommended outloading rate of 129 railcars per day.

(1) Acquire a minimum stock of blocking and bracing material needed to supplement the post organic supply for handling nonroadable equipment when a rapid deployment of post units is required.

(2) Acquire 124 sets of bridge plates for volume outloading of vehicles at Fort Polk.

(3) Acquire sufficient small tools, including power saws, cable cutters, wrecking bars, cable tensioning devices, hammers, and so forth, to permit operation of blocking and bracing crews at five outloading sites.

(4) Upgrade all track, indicated by Plan 4 in Figure 23, to federal track safety standard class 2 for main line and class 1 for spurs as a minimum, with a goal of improving spurs to class 2 (Appendix A).

(5) Construct one heavy timber portable or permanent end-loading ramp for loading vehicles at QM-1.

(6) Improve drainage and weed control.

b. In addition to the above, if installation officials foresee a future need for spurs, such as QM-4 and the PDO track, that may be used to serve facilities but are not included in the selected plan, the spurs should be upgraded along with the tracks required for outloading.

c. It should be noted that for additional expenditure of $52,300, the daily outloading rate could be increased to 254 railcars per day, Plan C. This plan was not recommended because:

(1) The additional capability was not requested and probably would never be required.

(2) Plan 4 includes all of the basic system and could be developed in the future if needed.

(3) The additional trackage and lighting for night operations would require yearly expenditures.

(4) Additional initial cost.

5. Summary of Time and Costs

The cost estimates utilized in this section were supplied by the facilities engineering personnel at Fort Polk. No times were given for projected completion dates on any improvements, but it should be noted that a full division could be in a poor contingency situation at Fort Polk for some time. The realistic goal is to have the improvements completed by the time the 5th Division is fully activated.

Figure 23 contains detailed cost figures. The line marked "Rail System Maintenance" shows a value of $276, 600 for Plans 3 through 8 and A through D, inclusively. These plans are under the "Maintained" column, while Plans 1 and 2 are under the "Current" column. The "Current" column indicates use of trackage that is currently available and in operating condition only; therefore, no costs are enumerated for Plans 1 or 2. The plans under the "Maintained" column use trackage that will require maintenance and/or repairs either immediately or in the near future, and specific costs are shown for each plan.

The breakdown of the proposed $276, 600 rail system maintenance costs is shown in Table II. Note that the cost to repair the wye at the KCS line is not listed in the table. This repair is not recommended since only one wye is needed and two are available, one at Leesville and one on post. Also, the cost ($500, 000) for the 115-pound relay rail, included in the Fort Polk estimate to replace main line rail on post, is not included because it is not needed according to TM 5-850-2 [2/]. The specification for new rail is 90-pound American Railway Association (ARA) "A" and must conform to the appropriate military specification. The requirement for 90-pound rail is frequent rail traffic or design train speeds of more than 40 miles per hour. Since neither of these requirements is fulfilled at Fort Polk, the presently used

[2/] TM 5-850-2, Railroad Design and Construction at Army and Air Force Installations, August 1971.

85-pound rail is adequate. Furthermore, if the rail is badly worn on one side, the rail can be turned around and reused; only defective rail should be replaced.

TABLE II
RAIL SYSTEM MAINTENANCE

Location	Cost in Dollars
Passing Track	8,600
North Main Wye*	8,000
Post Main	164,000
Line From KCS to Post	75,000
North Main	21,000
Total	276,600

*East leg of Wye

III. ANALYSIS OF COMMERCIAL RAIL FACILITIES WITHIN 25 MILES OF FORT POLK

All rail facilities within 25 miles of Fort Polk were analyzed to determine their feasibility during full-scale rail outloading operations at the installation. Many factors were considered in making the determinations, including:

1. Road access to the facility
2. Type of facility available--ramps, lighting
3. Equipment staging and queuing areas
4. Railcar storage and loading capacities
5. Track and facility maintenance conditions
6. Main line activity levels
7. Added expense of using commercial facilities
8. Security problems
9. Complication of splitting or relocating operations

Facilities belonging to the main line railroad are usually the best alternatives because rail facilities belonging to private concerns generally are unavailable and unsuited for military rail outloading operations. Also, those facilities located more than a few miles from the post need to have significant potential to make their use feasible.

The KCS agent at Leesville assisted in the determination of off-post rail capabilities, which are summarized in Table III. Specific conditions and/or deficiencies at the sites are that none of the locations have ramps or lights, and Leesville has the only acceptable staging area (Figures 24 through 26). Portable ramps could be used possibly at Leesville for daytime operations, but this is not recommended because most of the trackage will be needed for storage to support local service and full-scale activity at Fort Polk. The current activity level of the main line is four scheduled trains per day plus locals. Possible complications involving security and splitting of required operations are two important reasons to restrict use of off-post facilities for storage of empty cars.

TABLE III
RAILROAD FACILITIES WITHIN 25 MILES OF FORT POLK

Location and Figures	Road Distance From Fort Polk (Miles)	Type of Trackage Available	End Ramp	Lighting	Surface Condition	Staging Area	Storage Capacity (Railcars)	Road Access to Site
Leesville Figures 24, 25, and 26	6	Classification, storage 9 tracks "Y"	No	No	Fair	Open Fields, Streets	405	Good, by several roads
Anacoco	15	Siding	No	No	N/A	N/A	35	N/A
Ename	17	Passing	No	No	N/A	N/A	134	Very poor
Ludington	22	Classification, storage 4 tracks	No	No	Good	No	165	Fair; sand and gravel country road
Hornbeck	22	Siding	No	No	N/A	N/A	45	N/A

Figure [illegible] Leesville, Northward at the Railroad Station.

Figure 25. Leesville, Southward Toward the KCS Yard.

Figure 26. KCS Yard Consisting of 9 Tracks With 404 Railcars Storage Capacity.

IV. SPECIAL EQUIPMENT FOR EXPEDITING THE OUTLOADING OF SEMITRAILERS AND MILVANS

A large supply of trailer-on-flatcar (TOFC) railcars usually is available in the system, and container-on-flatcar (COFC) railcars may be available. These cars should be used to transport semitrailers and MILVANS. If COFC or TOFC flatcars are not available, some blocking and bracing time and expense can be saved by using bulkhead flatcars for transporting MILVANS. See Appendix C for additional information.

V. CONCLUSIONS

1. The condition of the railroad tracks at Fort Polk varies from good to unusable; however, current rail outloading capability is limited severely by lack of necessary supporting elements, such as outloading plans and blocking and bracing materials.

2. Because of Fort Polk's proximity to ocean terminals on the gulf coast, only nonroadable equipment would have to be outloaded by rail for gulf coast POEs. Necessary supplies should be stocked accordingly.

3. Estimated minimal cost to upgrade the rail system to achieve an outloading rate of 129 railcars per 24-hour day is $327,800; to achieve a maximum outloading rate of 254 railcars per day, $380,100. At these rates, the division nonroadable equipment could be outloaded by rail in approximately 6 and 3 days, respectively, after receipt of sufficient railcars to permit full-scale operations (requirement - 750 DODX and commercial railcars loaded at Fort Polk).[3]

4. Physical improvements to the rail system and other additions for outloading (sec II, para D4) should be implemented to coincide with full activation of the division.

5. The KCS railroad yard at Leesville should be used for classifying incoming empty railcars destined for Fort Polk.

6. The KCS has adequate railcar storage capacity to support a volume outloading of Fort Polk units.

7. The KCS trackage in the vicinity of Fort Polk is in generally good condition.

8. The KCS agent at Leesville believes that the KCS can handle the outloading of Fort Polk units concurrently with other demands.

9. Fort Polk transportation personnel should coordinate planning of the impending outloading operations with the KCS at the earliest possible date.

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[3] 5th Infantry Division Transportation Office.

VI. RECOMMENDATIONS

1. Undertake those items listed in section II, paragraph D4 (Recommended Physical Improvements and Additions). These improvements will provide a rail system capability of 129 railcars per day.

2. Using the simulation in Appendix B as an example, prepare a detailed unit outloading plan specifying unit assignments at loadout sites and movement functions.

3. Coordinate rail outloading plans with the KCS at the earliest possible date.

4. Initiate and/or continue facility maintenance to insure a continued effective rail system.

5. Provide advance training for blocking and bracing crews.

6. Use the KCS yard at Leesville to classify incoming empty railcars.

APPENDIX A

TRACK SAFETY STANDARDS *

PART 213 —TRACK SAFETY STANDARDS

AUTHORITY: The provisions of this Part 213 issued under sections 202 and 209, 84 Stat. 971, 975; 45 U.S.C. 431 and 438 and § 1.49(n) of the Regulations of the Office of the Secretary of Transportation; 49 CFR 1.49(n).

SOURCE: The provisions of this Part 213 appear at 36 F.R. 20336, Oct. 20, 1971, unless otherwise noted.

Subpart A—General

§ 213.1 Scope of part.

This part prescribes initial minimum safety requirements for railroad track

*Extracted from Title 49, Transportation, Parts 200 to 999, pp 8-19, Code of Federal Regulations, 1973.

that is part of the general railroad system of transportation. The requirements prescribed in this part apply to specific track conditions existing in isolation. Therefore, a combination of track conditions, none of which individually amounts to a deviation from the requirements in this part, may require remedial action to provide for safe operations over that track.

§ 213.3 Application.

(a) Except as provided in paragraphs (b) and (c) of this section, this part applies to all standard gage track in the general railroad system of transportation.

(b) This part does not apply to track—

(1) Located inside an installation which is not part of the general railroad system of transportation; or

(2) Used exclusively for rapid transit, commuter, or other short-haul passenger service in a metropolitan or suburban area.

(c) Until October 16, 1972, Subparts A, B, D (except § 213.109), E, and F of this part do not apply to track constructed or under construction before October 15, 1971. Until October 16, 1973, Subpart C and § 213.109 of Subpart D do not apply to track constructed or under construction before October 15, 1971.

§ 213.5 Responsibility of track owners.

(a) Any owner of track to which this part applies who knows or has notice that the track does not comply with the requirements of this part, shall—

(1) Bring the track into compliance; or

(2) Halt operations over that track.

(b) If an owner of track to which this part applies assigns responsibility for the track to another person (by lease or otherwise), any party to that assignment may petition the Federal Railroad Administrator to recognize the person to whom that responsibility is assigned for purposes of compliance with this part. Each petition must be in writing and include the following—

(1) The name and address of the track owner;

(2) The name and address of the person to whom responsibility is assigned (assignee);

(3) A statement of the exact relationship between the track owner and the assignee;

(4) A precise identification of the track;

(5) A statement as to the competence and ability of the assignee to carry out the duties of the track owner under this part; and

(6) A statement signed by the assignee acknowledging the assignment to him of responsibility for purposes of compliance with this part.

(c) If the Administrator is satisfied that the assignee is competent and able to carry out the duties and responsibilities of the track owner under this part, he may grant the petition subject to any conditions he deems necessary. If the Administrator grants a petition under this section, he shall so notify the owner and the assignee. After the Administrator grants a petition, he may hold the track owner or the assignee or both responsible for compliance with this part and subject to penalties under § 213.15.

§ 213.7 Designation of qualified persons to supervise certain renewals and inspect track.

(a) Each track owner to which this part applies shall designate qualified persons to supervise restorations and renewals of track under traffic conditions. Each person designated must have—

(1) At least—

(i) One year of supervisory experience in railroad track maintenance; or

(ii) A combination of supervisory experience in track maintenance and training from a course in track maintenance or from a college level educational program related to track maintenance;

(2) Demonstrated to the owner that he—

(i) Knows and understands the requirements of this part;

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(3) Written authorization from the track owner to prescribe remedial actions to correct or safely compensate for deviations from the requirements in this part.

(b) Each track owner to which this part applies shall designate qualified persons to inspect track for defects. Each person designated must have—

(1) At least—

(i) One year of experience in railroad track inspection: or

(ii) A combination of experience in track inspection and training from a course in track inspection or from a college level educational program related to track inspection;

(2) Demonstrated to the owner that he—

(i) Knows and understands the requirements of this part;

(ii) Can detect deviations from those requirements; and

(iii) Can prescribe appropriate remedial action to correct or safely compensate for those deviations; and

(3) Written authorization from the track owner to prescribe remedial actions to correct or safely compensate for deviations from the requirements of this part, pending review by a qualified person designated under paragraph (a) of this section.

(c) With respect to designations under paragraphs (a) and (b) of this section, each track owner must maintain written records of—

(1) Each designation in effect;

(2) The basis for each designation, and

(3) Track inspections made by each designated qualified person as required by § 213.241.

These records must be kept available for inspection or copying by the Federal Railroad Administrator during regular business hours.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 875, Jan. 5, 1973]

§ 213.9 Classes of track: operating speed limits.

(a) Except as provided in paragraphs (b) and (c) of this section and §§ 213.57 (b), 213.59(a), 213.105, 213.113 (a) and (b), and 213.137 (b) and (c), the following maximum allowable operating speeds apply:

[In miles per hour]

Over track that meets all of the requirements prescribed in this part for—	The maximum allowable operating speed for freight trains is—	The maximum allowable operating speed for passenger trains is—
Class 1 track	10	15
Class 2 track	25	30
Class 3 track	40	60
Class 4 track	60	80
Class 5 track	80	90
Class 6 track	110	110

(b) If a segment of track does not meet all of the requirements for its intended class, it is reclassified to the next lowest class of track for which it does meet all of the requirements of this part. However, if it does not at least meet the requirements for class 1 track, no operations may be conducted over that segment except as provided in § 213.11.

(c) Maximum operating speed may not exceed 110 m.p.h. without prior approval of the Federal Railroad Administrator. Petitions for approval must be filed in the manner and contain the information required by § 211.11 of this chapter. Each petition must provide sufficient information concerning the performance characteristics of the track, signaling, grade crossing protection, trespasser control where appropriate, and equipment involved and also concerning maintenance and inspection practices and procedures to be followed, to establish that the proposed speed can be sustained in safety.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 875, Jan. 5, 1973; 38 FR 23405, Aug. 30, 1973]

§ 213.11 Restoration or renewal of track under traffic conditions.

If, during a period of restoration or renewal, track is under traffic conditions and does not meet all of the requirements prescribed in this part, the work and operations on the track must be under the continuous supervision of a person designated under § 213.7(a).

§ 213.13 Measuring track not under load.

When unloaded track is measured to determine compliance with requirements of this part, the amount of rail movement, if any, that occurs while the track is loaded must be added to the measurement of the unloaded track.

[38 FR 875, Jan. 5, 1973]

§ 213.15 Civil penalty.

(a) Any owner of track to which this part applies, or any person held by the Federal Railroad Administrator to be responsible under § 213.5(c), who violates any requirement prescribed in this part is subject to a civil penalty of at least $250 but not more than $2,500.

(b) For the purpose of this section, each day a violation persists shall be treated as a separate offense.

Exemptions.

(a) Any owner of track to which this part applies may petition the Federal Railroad Administrator for exemption from any or all requirements prescribed in this part.

(b) Each petition for exemption under this section must be filed in the manner and contain the information required by § 211.11 of this chapter.

(c) If the Administrator finds that an exemption is in the public interest and is consistent with railroad safety, he may grant the exemption subject to any conditions he deems necessary. Notice of each exemption granted is published in the FEDERAL REGISTER together with a statement of the reasons therefor.

Subpart B—Roadbed

§ 213.31 Scope.

This subpart prescribes minimum requirements for roadbed and areas immediately adjacent to roadbed.

§ 213.33 Drainage.

Each drainage or other water carrying facility under or immediately adjacent to the roadbed must be maintained and kept free of obstruction, to accommodate expected water flow for the area concerned.

§ 213.37 Vegetation.

Vegetation on railroad property which is on or immediately adjacent to roadbed must be controlled so that it does not—

(a) Become a fire hazard to track-carrying structures;

(b) Obstruct visibility of railroad signs and signals;

(c) Interfere with railroad employees performing normal trackside duties;

(d) Prevent proper functioning of signal and communication lines; or

(e) Prevent railroad employees from visually inspecting moving equipment from their normal duty stations.

Subpart C—Track Geometry

§ 213.51 Scope.

This subpart prescribes requirements for the gage, alinement, and surface of track, and the elevation of outer rails and speed limitations for curved track.

§ 213.53 Gage.

(a) Gage is measured between the heads of the rails at right angles to the rails in a plane five-eighths of an inch below the top of the rail head.

(b) Gage must be within the limits prescribed in the following table:

Class of track	The gage of tangent track must be—		The gage of curved track must be—	
	At least—	But not more than—	At least—	But not more than—
1	4′ 8″	4′ 9¾″	4′ 8″	4′ 9¾″
2 and 3	4′ 8″	4′ 9½″	4′ 8″	4′ 9¾″
4	4′ 8″	4′ 9¼″	4′ 8″	4′ 9½″
5	4′ 8″	4′ 9″	4′ 8″	4′ 9½″
6	4′ 8″	4′ 8¾″	4′ 8″	4′ 9″

§ 213.55 Alinement.

Alinement may not deviate from uniformity more than the amount prescribed in the following table:

Class of track	Tangent track	Curved track
	The deviation of the mid-offset from 62-foot line [1] may not be more than—	The deviation of the mid-ordinate from 62-foot chord [2] may not be more than—
1	5″	5″
2	3″	3″
3	1¾″	1¾″
4	1½″	1½″
5	¾″	⅝″
6	½″	⅜″

[1] The ends of the line must be at points on the gage side of the line rail, five eighths of an inch below the top of the railhead. Either rail may be used as the line rail, however, the same rail must be used for the full length of that tangential segment of track.

[2] The ends of the chord must be at points on the gage side of the outer rail, five-eighths of an inch below the top of the railhead.

§ 213.57 Curves; elevation and speed limitations.

(a) Except as provided in § 213.63, the outside rail of a curve may not be lower than the inside rail or have more than 6 inches of elevation.

(b) The maximum allowable operating speed for each curve is determined by the following formula:

$$V_{max} = \sqrt{\frac{E_a + 3}{0.0007d}}$$

where

V_{max} = Maximum allowable operating speed (miles per hour).

E_a = Actual elevation of the outside rail (inches).

d = Degree of curvature (degrees).

Appendix A is a table of maximum allowable operating speed computed in accordance with this formula for various elevations and degrees of curvature.

§ 213.59 Elevation of curved track; runoff.

(a) If a curve is elevated, the full elevation must be provided throughout the curve, unless physical conditions do not permit. If elevation runoff occurs in a curve, the actual minimum elevation must be used in computing the maximum allowable operating speed for that curve under § 213.57(b).

(b) Elevation runoff must be at a uniform rate, within the limits of track surface deviation prescribed in § 213.63, and it must extend at least the full length of the spirals. If physical conditions do not permit a spiral long enough to accommodate the minimum length of runoff, part of the runoff may be on tangent track.

§ 213.61 Curve data for Classes 4 through 6 track.

(a) Each owner of track to which this part applies shall maintain a record of each curve in its Classes 4 through 6 track. The record must contain the following information:

(1) Location;

(2) Degree of curvature;

(3) Designated elevation;

(4) Designated length of elevation runoff; and

(5) Maximum allowable operating speed.

[38 FR 875, Jan. 5, 1973]

§ 213.63 Track surface.

Each owner of the track to which this part applies shall maintain the surface of its track within the limits prescribed in the following table:

Track surface	Class of track					
	1	2	3	4	5	6
The runoff in any 31 feet of rail at the end of a raise may not be more than	3½"	3"	2"	1½"	1"	½"
The deviation from uniform profile on either rail at the midordinate of a 62-foot chord may not be more than	3"	2¾"	2¼"	2"	1¼"	½"
Deviation from designated elevation on spirals may not be more than	1¾"	1½"	1¼"	1"	¾"	½"
ariation in cross level on spirals in any 31 feet may not be more than	2"	1¾"	1¼"	1"	¾"	½"
Deviation from zero cross level at any point on tangent or from designated elevation on curves between spirals may not be more than	3"	2"	1¾"	1¼"	1"	½"
The difference in cross level between any two points less than 62 feet apart on tangents and curves between spirals may not be more than	3"	2"	1¾"	1¼"	1"	½"

Subpart D—Track Structure

§ 213.101 Scope.

This subpart prescribes minimum requirements for ballast, crossties, track assembly fittings, and the physical condition of rails.

§ 213.103 Ballast; general.

Unless it is otherwise structurally supported, all track must be supported by material which will—

(a) Transmit and distribute the load of the track and railroad rolling equipment to the subgrade;

(b) Restrain the track laterally, longitudinally, and vertically under dynamic loads imposed by railroad rolling equipment and thermal stress exerted by the rails;

(c) Provide adequate drainage for the track; and

(d) Maintain proper track cross-level, surface, and alinement.

§ 213.105 Ballast; disturbed track.

If track is disturbed, a person designated under § 213.7 shall examine the track to determine whether or not the ballast is sufficiently compacted to perform the functions described in § 213.103. If the person making the examination considers it to be necessary in the interest of safety, operating speed over the disturbed segment of track must be

reduced to a speed that he considers safe.

§ 213.109 Crossties.

(a) Crossties may be made of any material to which rails can be securely fastened. The material must be capable of holding the rails to gage within the limits prescribed in § 213.53(b) and distributing the load from the rails to the ballast section.

(b) A timber crosstie is considered to be defective when it is—

(1) Broken through;

(2) Split or otherwise impaired to the extent it will not hold spikes or will allow the ballast to work through;

(3) So deteriorated that the tie plate or base of rail can move laterally more than one-half inch relative to the crosstie;

(4) Cut by the tie plate through more than 40 percent of its thickness; or

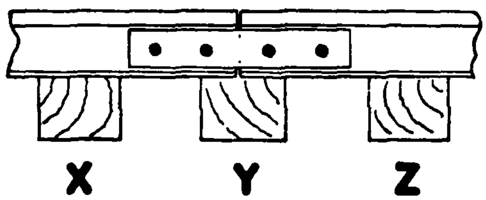
(5) Not spiked as required by § 213.127.

(c) If timber crossties are used, each 39 feet of track must be supported by nondefective ties as set forth in the following table:

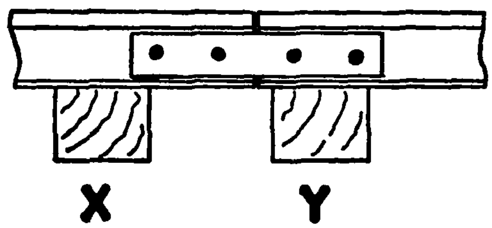
Class of track	Minimum number of nondefective ties per 39 feet of track	Maximum distance between nondefective ties (center to center) (inches)
1	5	100
2, 3	8	70
4, 5	12	48
6	14	48

(d) If timber ties are used, the minimum number of nondefective ties under a rail joint and their relative positions under the joint are described in the following chart. The letters in the chart correspond to letters underneath the ties for each type of joint depicted.

SUPPORTED JOINT



SUSPENDED JOINT



Class of track	Minimum number of nondefective ties under a joint	Required position of nondefective ties: Supported joint	Required position of nondefective ties: Suspended joint
1	1	X, Y, or Z	X or Y.
2, 3	1	Y	X or Y.
4, 5, 6	2	X and Y, or Y and Z.	X and Y.

(e) Except in an emergency or for a temporary installation of not more than 6-months duration, crossties may not be interlaced to take the place of switch ties.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 875, Jan. 5, 1973]

§ 213.113 Defective rails.

(a) When an owner of track to which this part applies learns, through inspection or otherwise, that a rail in that track contains any of the defects listed in the following table, a person designated under § 213.7 shall determine whether or not the track may continue in use. If he determines that the track may continue in use, operation over the defective rail is not permitted until—

(1) The rail is replaced; or

(2) The remedial action prescribed in the table is initiated:

Remedial Action

Defect	Length of defect (inch)		Percent of railhead cross-sectional area weakened by defect		If defective rail is not replaced, take the remedial action prescribed in note—
	More than	But not more than	Less than	But not less than	
Transverse fissure			20		B.
			100	20	B.
				100	A.
Compound fissure			20		B.
			100	20	B.
				100	A.
Detail fracture Engine burn fracture Defective weld			20		C.
			100	20	D.
				100	A, or E and H.
Horizontal split head Vertical split head	0	2			H and F.
	2	4			I and G.
	4				B.
	(Break out in railhead)				A.
Split web Piped rail Head web separation	0	½			H and F.
	½	3			I and G.
	3				B.
	(Break out in railhead)				A.
Bolt hole crack	0	½			H and F.
	½	1½			I and G.
	1½				B.
	(Break out in railhead)				A.
Broken base	0	6			E and I.
	6				(Replace rail).
Ordinary break					A or E.
Damaged rail					C.

NOTE:
A—Assign person designated under § 213.7 to visually supervise each operation over defective rail.
B—Limit operating speed to 10 m.p.h. over defective rail.
C—Apply joint bars bolted *only through* the outermost holes to defect within 20 days after it is determined to continue the track in use. In the case of classes 3 through 6 track, limit operating speed over defective rail to 30 m.p.h. until angle bars are applied; thereafter, limit speed to 50 m.p.h. or the maximum allowable speed under § 213.9 for the class of track concerned, whichever is lower.
D—Apply joint bars bolted only through the outermost holes to defect within 10 days after it is determined to continue the track in use. Limit operating speed over defective rail to 10 m.p.h. until angle bars are applied; *thereafter, limit speed to 50 m.p.h. or the maximum allowable speed under § 213.9 for* the class of track concerned, whichever is lower.
E—Apply joint bars to defect and bolt in accordance with § 213.121 (d) and (e).
F—Inspect rail 90 days after it is determined to continue the track in use.
G—Inspect rail 30 days after it is determined to continue the track in use.
H—Limit operating speed over defective rail to 50 m.p.h. or the maximum allowable speed under § 213.9 for the class of track concerned, whichever is lower.
I—*Limit operating speed over defective rail* to 30 m.p.h. or the maximum allowable speed under § 213.9 for the class of track concerned, whichever is lower.

(b) If a rail in classes 3 through 6 track or class 2 track on which passenger trains operate evidences any of the conditions listed in the following table, the remedial action prescribed in the table must be taken:

Condition	Remedial action	
	If a person designated under § 213.7 determines that condition requires rail to be replaced	If a person designated under § 213.7 determines that condition does not require rail to be replaced
Shelly spots Head checks Engine burn (but not fracture) Mill defect	Limit speed to 20 m.p.h. and schedule the rail for replacement.	Inspect the rail for internal defects at intervals of not more than every 12 months.
Flaking Slivered Corrugated Corroded	do	Inspect the rail at intervals of not more than every 6 months.

(c) As used in this section—

(1) "Transverse Fissure" means a progressive crosswise fracture starting from a crystalline center or nucleus inside the head from which it spreads outward as a smooth, bright, or dark, round or oval surface substantially at a right angle to the length of the rail. The distinguishing features of a transverse fissure from other types of fractures or defects are the crystalline center or nucleus and the nearly smooth surface of the development which surrounds it.

(2) "Compound Fissure" means a progressive fracture originating in a horizontal split head which turns up or down in the head of the rail as a smooth, bright, or dark surface progressing until substantially at a right angle to the length of the rail. Compound fissures require examination of both faces of the fracture to locate the horizontal split head from which they originate.

(3) "Horizontal Split Head" means a horizontal progressive defect originating inside of the rail head, usually one-quarter inch or more below the running surface and progressing horizontally in all directions, and generally accompanied by a flat spot on the running surface. The defect appears as a crack lengthwise of the rail when it reaches the side of the rail head.

(4) "Vertical Split Head" means a vertical split through or near the middle of the head, and extending into or through it. A crack or rust streak may show under the head close to the web or pieces may be split off the side of the head.

(5) "Split Web" means a lengthwise crack along the side of the web and extending into or through it.

(6) "Piped Rail" means a vertical split in a rail, usually in the web, due to failure of the sides of the shrinkage cavity in the ingot to unite in rolling.

(7) "Broken Base" means any break in the base of a rail.

(8) "Detail Fracture" means a progressive fracture originating at or near the surface of the rail head. These fractures should not be confused with transverse fissures, compound fissures, or other defects which have internal origins. Detail fractures may arise from shelly spots, head checks, or flaking.

(9) "Engine Burn Fracture" means a progressive fracture originating in spots where driving wheels have slipped on top of the rail head. In developing downward they frequently resemble the compound or even transverse fissure with which they should not be confused or classified.

(10) "Ordinary Break" means a partial or complete break in which there is no sign of a fissure, and in which none of the other defects described in this paragraph are found.

(11) "Damaged rail" means any rail broken or injured by wrecks, broken, flat, or unbalanced wheels, slipping, or similar causes.

(12) "Shelly spots" means a condition where a thin (usually three-eighths inch in depth or less) shell-like piece of surface metal becomes separated from the parent metal in the railhead, generally at the gage corner. It may be evidenced by a black spot appearing on the railhead over the zone of separation or a piece of metal breaking out completely, leaving a shallow cavity in the railhead. In the case of a small shell there may be no surface evidence, the existence of the shell being apparent only after the rail is broken or sectioned.

(13) "Head checks" mean hair fine cracks which appear in the gage corner of the rail head, at any angle with the length of the rail. When not readily visible the presence of the checks may often be detected by the raspy feeling of their sharp edges.

(14) "Flaking" means small shallow flakes of surface metal generally not more than one-quarter inch in length or width break out of the gage corner of the railhead.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 875, Jan. 5, 1973; 38 FR 1508, Jan. 15, 1973]

§ 213.115 Rail end mismatch.

Any mismatch of rails at joints may not be more than that prescribed by the following table:

Class of track	Any mismatch of rails at joints may not be more than the following—	
	On the trend of the rail ends (inch)	On the gage side of the rail ends (inch)
1	1/4	1/4
2	1/4	3/16
3	3/16	3/16
4, 5	1/8	1/8
6	1/8	1/8

§ 213.117 Rail end batter.

(a) Rail end batter is the depth of depression at one-half inch from the rail end. It is measured by placing an 18-inch straightedge on the tread on the rail end, without bridging the joint, and measuring the distance between the bottom of the straightedge and the top of the rail at one-half inch from the rail end.

(b) Rail end batter may not be more than that prescribed by the following table:

Class of track	*Rail end batter may not be more than— (inch)*
1	1/2
2	3/8
3	3/8
4	1/4
5	1/8
6	1/8

§ 213.119 Continuous welded rail.

(a) When continuous welded rail is being installed, it must be installed at, or adjusted for, a rail temperature range

that should not result in compressive or tensile forces that will produce lateral displacement of the track or pulling apart of rail ends or welds.

(b) *After continuous* welded rail has been installed it should not be disturbed at rail temperatures higher than its installation or adjusted installation temperature.

§ 213.121 Rail joints.

(a) Each rail joint, insulated joint, and compromise joint must be of the proper design and dimensions for the rail on which it is applied.

(b) If a joint bar on classes 3 through 6 track is cracked, broken, or because of wear allows vertical movement of either rail when all bolts are tight, it must be replaced.

(c) If a joint bar is cracked or broken between the middle two bolt holes it must be replaced.

(d) In the case of conventional jointed track, each rail must be bolted with at least two bolts at each joint in classes 2 through 6 track, and with at least one bolt in class 1 track.

(e) In the case of continuous welded rail track, each rail must be bolted with at least two bolts at each joint.

(f) Each joint bar must be held in position by track bolts tightened to allow the joint bar to firmly support the abutting rail ends and to allow longitudinal movement of the rail in the joint to accommodate expansion and contraction due to temperature variations. When out-of-face, no-slip, joint-to-rail contact exists by design, the requirements of this paragraph do not apply. Those locations are considered to be continuous welded rail track and must meet all the requirements for continuous welded rail track prescribed in this part.

(g) No rail or angle bar having a torch cut or burned bolt hole may be used in classes 3 through 6 track.

§ 213.123 Tie plates.

(a) In classes 3 through 6 track where timber crossties are in use there must be tie plates under the running rails on at least eight of any 10 consecutive ties.

(b) Tie plates having shoulders must be placed so that no part of the shoulder is under the base of the rail.

§ 213.125 Rail anchoring.

Longitudinal rail movement must be effectively controlled. If rail anchors which bear on the sides of ties are used for this purpose, they must be on the same side of the tie on both rails.

§ 213.127 Track spikes.

(a) When conventional track is used with timber ties and cut track spikes, the rails must be spiked to the ties with at least one line-holding spike on the gage side and one line-holding spike on the field side. The total number of track spikes per rail per tie, including plate-holding spikes, must be at least the number prescribed in the following table:

MINIMUM NUMBER OF TRACK SPIKES PER RAIL PER TIE, INCLUDING PLATE-HOLDING SPIKES

Class of track	Tangent track and curved track with not more than 2° of curvature	Curved track with more than 2° but not more than 4° of curvature	Curved track with more than 4° but not more than 6° of curvature	Curved track with more than 6° of curvature
1	2	2	2	2
2	2	2	2	3
3	2	2	2	3
4	2	2	3	
5	2	3		
6	2			

(b) A tie that does not meet the requirements of paragraph (a) of this section is considered to be defective for the purposes of § 213.109(b).

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

§ 213.129 Track shims.

(a) If track does not meet the geometric standards in Subpart C of this part and working of ballast is not possible due to weather or other natural conditions, track shims may be installed to correct the deficiencies. If shims are used, they must be removed and the track resurfaced as soon as weather and other natural conditions permit.

(b) When shims are used they must be—

(1) At least the size of the tie plate;

(2) Inserted directly on top of the tie, beneath the rail and tie plate;

(3) Spiked directly to the tie with spikes which penetrate the tie at least 4 inches.

(c) When a rail is shimmed more than 1½ inches, it must be securely braced on at least every third tie for the full length of the shimming.

(d) When a rail is shimmed more than 2 inches a combination of shims and 2-

inch or 4-inch planks, as the case may be, must be used with the shims on top of the planks.

§ 213.131 Planks used in shimming.

(a) Planks used in shimming must be at least as wide as the tie plates, but in no case less than 5½ inches wide. Whenever possible they must extend the full length of the tie. If a plank is shorter than the tie, it must be at least 3 feet long and its outer end must be flush with the end of the tie.

(b) When planks are used in shimming on uneven ties, or if the two rails being shimmed heave unevenly, additional shims may be placed between the ties and planks under the rails to compensate for the unevenness.

(c) Planks must be nailed to the ties with at least four 8-inch wire spikes. Before spiking the rails or shim braces, planks must be bored with ⅝-inch holes.

§ 213.133 Turnouts and track crossings generally.

(a) In turnouts and track crossings, the fastenings must be intact and maintained so as to keep the components securely in place. Also, each switch, frog, and guard rail must be kept free of obstructions that may interfere with the passage of wheels.

(b) Classes 4 through 6 track must be equipped with rail anchors through and on each side of track crossings and turnouts, to restrain rail movement affecting the position of switch points and frogs.

(c) Each flangeway at turnouts and track crossings must be at least 1½ inches wide.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

§ 213.135 Switches.

(a) Each stock rail must be securely seated in switch plates, but care must be used to avoid canting the rail by overtightening the rail braces.

(b) Each switch point must fit its stock rail properly, with the switch stand in either of its closed positions to allow wheels to pass the switch point. Lateral and vertical movement of a stock rail in the switch plates or of a switch plate on a tie must not adversely affect the fit of the switch point to the stock rail.

(c) Each switch must be maintained so that the outer edge of the wheel tread cannot contact the gage side of the stock rail.

(d) The heel of each switch rail must be secure and the bolts in each heel must be kept tight.

(e) Each switch stand and connecting rod must be securely fastened and operable without excessive lost motion.

(f) Each throw lever must be maintained so that it cannot be operated with the lock or keeper in place.

(g) Each switch position indicator must be clearly visible at all times.

(h) Unusually chipped or worn switch points must be repaired or replaced. Metal flow must be removed to insure proper closure.

§ 213.137 Frogs.

(a) The flangeway depth measured from a plane across the wheel-bearing area of a frog on class 1 track may not be less than 1⅜ inches, or less than 1½ inches on classes 2 through 6 track.

(b) If a frog point is chipped, broken, or worn more than five-eighths inch down and 6 inches back, operating speed over that frog may not be more than 10 miles per hour.

(c) If the tread portion of a frog casting is worn down more than three-eighths inch below the original contour, operating speed over that frog may not be more than 10 miles per hour.

§ 213.139 Spring rail frogs.

(a) The outer edge of a wheel tread may not contact the gage side of a spring wing rail.

(b) The toe of each wing rail must be solidly tamped and fully and tightly bolted.

(c) Each frog with a bolt hole defect or head-web separation must be replaced.

(d) Each spring must have a tension sufficient to hold the wing rail against the point rail.

(e) The clearance between the hold-down housing and the horn may not be more than one-fourth of an inch.

§ 213.141 Self-guarded frogs.

(a) The raised guard on a self-guarded frog may not be worn more than three-eighths of an inch.

(b) If repairs are made to a self-guarded frog without removing it from service, the guarding face must be restored before rebuilding the point.

§ 213.143 Frog guard rails and guard faces; gage.

The guard check and guard face gages in frogs must be within the limits prescribed in the following table:

Class of track	Guard check gage	Guard face gage
	The distance between the gage line of a frog to the guard line [1] of its guard rail or guarding face, measured across the track at right angles to the gage line, [2] may not be less than—	The distance between guard lines, [1] measured across the track at right angles to the gage line, [2] may not be more than—
1	4' 6⅛"	4' 5¼"
2	4' 6¼"	4' 5⅛"
3, 4	4' 6⅜"	4' 5⅛"
5, 6	4' 6½"	4' 5"

[1] A line along that side of the flangeway which is nearer to the center of the track and at the same elevation as the gage line.

[2] A line ⅝ inch below the top of the center line of the head of the running rail, or corresponding location of the tread portion of the track structure.

Subpart E—Track Appliances and Track-Related Devices

§ 213.201 Scope.

This subpart prescribes minimum requirements for certain track appliances and track-related devices.

§ 213.205 Derails.

(a) Each derail must be clearly visible. When in a locked position a derail must be free of any lost motion which would allow it to be operated without removing the lock.

(b) When the lever of a remotely controlled derail is operated and latched it must actuate the derail.

§ 213.207 Switch heaters.

The operation of a switch heater must not interfere with the proper operation of the switch or otherwise jeopardize the safety of railroad equipment.

Subpart F—Inspection

§ 213.231 Scope.

This subpart prescribes requirements for the frequency and manner of inspecting track to detect deviations from the standards prescribed in this part.

§ 213.233 Track inspections.

(a) All track must be inspected in accordance with the schedule prescribed in paragraph (c) of this section by a person designated under § 213.7.

(b) Each inspection must be made on foot or by riding over the track in a vehicle at a speed that allows the person making the inspection to visually inspect the track structure for compliance with this part. However, mechanical or electrical inspection devices approved by the Federal Railroad Administrator may be used to supplement visual inspection. If a vehicle is used for visual inspection, the speed of the vehicle may not be more than 5 miles per hour when passing over track crossings, highway crossings, or switches.

(c) Each track inspection must be made in accordance with the following schedule:

Class of track	Type of track	Required frequency
1, 2, 3	Main track and sidings.	*Weekly* with at least 3 calendar days interval between inspections, or *before use*, if the track is used less than once a week, or *twice weekly* with at least 1 calendar day interval between inspections, if the track carries passenger trains or more than 10 million gross tons of traffic during the preceding calendar year.
1, 2, 3	Other than main track and sidings.	*Monthly* with at least 20 calendar days interval between inspections.
4, 5, 6		*Twice weekly* with at least 1 calendar day interval between inspections.

(d) If the person making the inspection finds a deviation from the requirements of this part, he shall immediately initiate remedial action.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

§ 213.235 Switch and track crossing inspections.

(a) Except as provided in paragraph (b) of this section, each switch and track crossing must be inspected on foot at least monthly.

(b) In the case of track that is used less than once a month, each switch and track crossing must be inspected on foot before it is used.

§ 213.237 Inspection of rail.

(a) In addition to the track inspections required by § 213.233, at least once a

year a continuous search for internal defects must be made of all jointed and welded rails in Classes 4 through 6 track, and Class 3 track over which passenger trains operate. However, in the case of a new rail, if before installation or within 6 months thereafter it is inductively or ultrasonically inspected over its entire length and all defects are removed, the next continuous search for internal defects need not be made until 3 years after that inspection.

(b) Inspection equipment must be capable of detecting defects between joint bars, in the area enclosed by joint bars.

(c) Each defective rail must be marked with a highly visible marking on both sides of the web and base.

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

§ 213.239 Special inspections.

In the event of fire, flood, severe storm, or other occurrence which might have damaged track structure, a special inspection must be made of the track involved as soon as possible after the occurrence.

§ 213.241 Inspection records.

(a) Each owner of track to which this part applies shall keep a record of each inspection required to be performed on that track under this subpart.

(b) Each record of an inspection under §§ 213.233 and 213.235 shall be prepared on the day the inspection is made and signed by the person making the inspection. Records must specify the track inspected, date of inspection, location and nature of any deviation from the requirements of this part, and the remedial action taken by the person making the inspection. The owner shall retain each record at its division headquarters for at least 1 year after the inspection covered by the record.

(c) Rail inspection records must specify the date of inspection, the location, and nature of any internal rail defects found, and the remedial action taken and the date thereof. The owner shall retain a rail inspection record for at least 2 years after the inspection and for 1 year after remedial action is taken.

(d) Each owner required to keep inspection records under this section shall make those records available for inspection and copying by the Federal Railroad Administrator.

Appendix A—Maximum Allowable Operating Speeds for Curved Track

Elevation of outer rail (inches)

Degree of Curvature	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6
	Maximum allowable operating speed (mph)												
0°30′	93	100	107										
0°40′	80	87	93	98	103	109							
0°50′	72	78	83	88	93	97	101	106	110				
1°00′	66	71	76	80	85	89	93	96	100	104	107	110	
1°15′	59	63	68	72	76	79	83	86	89	93	96	99	101
1°30′	54	58	62	66	69	72	76	79	82	85	87	90	93
1°45′	50	54	57	61	64	67	70	73	76	78	81	83	86
2°00′	46	50	54	57	60	63	66	68	71	73	76	78	80
2°15′	44	47	50	54	56	59	62	64	67	69	71	74	76
2°30′	41	45	48	51	54	56	59	61	63	66	68	70	72
2°45′	40	43	46	48	51	54	56	58	60	62	65	66	68
3°00′	38	41	44	46	49	51	54	56	58	60	62	64	66
3°15′	36	39	42	45	47	49	51	54	56	57	59	61	63
3°30′	35	38	40	43	45	47	50	52	54	55	57	59	61
3°45′	34	37	39	41	44	46	48	50	52	54	55	57	59
4°00′	33	35	38	40	42	44	46	48	50	52	54	55	57
4°30′	31	33	36	38	40	42	44	45	47	49	50	52	54
5°00′	29	32	34	36	38	40	41	43	45	46	48	49	51
5°30′	28	30	32	34	36	38	40	41	43	44	46	47	48
6°00′	27	29	31	33	35	36	38	39	41	42	44	45	46
6°30′	26	28	30	31	33	35	36	38	39	41	42	43	45
7°00′	25	27	29	30	32	34	35	36	38	39	40	42	43
8°00′	23	25	27	28	30	31	33	34	35	37	38	39	40
9°00′	22	24	25	27	28	30	31	32	33	35	36	37	38
10°00′	21	22	24	25	27	28	29	31	32	33	34	35	36
11°00′	20	21	23	24	26	27	28	29	30	31	32	33	34
12°00′	19	20	22	23	24	26	27	28	29	30	31	32	3

[36 FR 20336, Oct. 20, 1971, as amended at 38 FR 876, Jan. 5, 1973]

APPENDIX B

PROPOSED RAIL OUTLOADING PROCEDURE AT FORT POLK

Maximum rail outloading operations use a simple cyclic schedule to minimize conflicts and improve control. The recommended outloading plan, Plan 4, is shown in Figure 27. All plans shown in the capability matrix (Figure 23) follow the same basic idea, with greater outloading capability requiring more effort and greater cost.

The simulation begins with the assumption that it takes several days to accumulate the necessary number of railcars to start full-scale outloading operations. The switching locomotive positions the arriving railcars, according to a preconceived plan, at the designated loadout sites. At the same time, the equipment to be loaded aboard the cars is prepared and staged, and loading, blocking, and bracing begins. Personnel should be used to throw switches and act as road guards at all crossings to reduce delays. Using these parameters and the other assumptions in the rail system analysis, the cyclic schedule starts when the loaded cars at spurs OS-1 and OS-2 are ready to be pulled and shipped.

To understand more readily the simulation in Plan 4, Figure 27 (the line diagram of Plan 4), which follows, should be examined first. The operation proceeds as follows:

Locomotives arrive from Leesville with no empty railcars, proceed to track OS-1 to couple with 39 loaded railcars (C-39-L), then wait on the main line near the passing track. Simultaneously the switching engine on post for the operation proceeds to track OS-2 couples with 19 loaded cars (C-19-L), pulls the cars up the main line, uncouples, and goes around the string by use of the passing track. The locomotives now couple with the 19, making a total of 58 loaded cars (39+19=58), and wait for the switching engine to bring the loaded cars out of OS-3

LEGEND	
C	COUPLE
UC	UNCOUPLE
TR	TRANSIT
L	LOADED
E	EMPTY
39	NUMBER OF RAILCARS
OS-1	TRACK LOCATION
TRK	TRACK
QM	QUARTERMASTER
——	DAY DEAD TIME (NOTE CANNOT BE USED FOR LOADING, BLOCKING AND [illegible] OR INSPECTION)
(15)	TIME EXPENDED IN MINUTES

NOTE

TWO KCS MAIN LINE UNITS BRING THE 129 EMPTY RAILCARS FROM LEESVILLE WITH ONE UNIT IN THE LEAD AND ONE UNIT TRAILING. THE TRAIN IS IN A POSITION SOUTH OF THE WYE ON THE KCS MAIN TRACK WITH THE LEAD ENGINE ALREADY UNCOUPLED AND WAITING FOR THE TRAIN CARRYING THE LOADED CARS TO EXIT THE POST. AS SOON AS THE LOADED TRAIN PASSES THROUGH THE WYE, THE REAR UNIT BACKS UP WITH THE STRING OF 129 EMPTIES, LEAVING THE LEAD UNIT SITTING ON THE KCS MAIN TRACK, OUT OF THE WAY. AFTER THE TRAIN IS BACKED UP ENOUGH TO CLEAR THE WYE, THE SWITCH ENGINE WHICH HAS BEEN WAITING JUST EAST OF THE WYE COMES OUT ONTO THE KCS MAIN TRACK AND COUPLES THE STRING OF 129 EMPTIES. THE SWITCH ENGINE NOW LEADS THE TRAIN ONTO THE POST MAIN WITH THE MAIN LINE ENGINE PUSHING THE TRAIN. THE MAIN LINE UNIT THAT HAS BEEN WAITING JUST SOUTH OF THE WYE NOW GOES BACK TO LEESVILLE

PLAN 4

MAIN LINE LOCOMOTIVE →

OPERA
TIME
TRACK
NUMB

TRACK DESCRIPTION & NUMBER
OS-1
OS-2
OS-3
QM-1
QM-6

SWITCH ENGINE →

OPERA
TIME
TRACK
NUMB

OPERATION	C 39 L	TR	WAIT	TR	C 19 L	TR	WAIT	TR	C 16 L	TR	WAIT	TR
TIME (MINUTES)	(15)	(5)	(10)	(5)	(15)	(5)	(10)	(5)	(15)	(5)	(10)	(5)
TRACK LOCATION	OS 1	MAIN	MAIN	MAIN	MAIN	MAIN	MAIN	MAIN	MAIN	MAIN	MAIN	MAIN
NUMBER OF RAILCARS	39	39	39	39	58	58	58	58	74	74	74	74

NUMBER	RAILCAR CAPACITY
	39
	19
	16
	26
	29

OPERATION	C-19-L	TR	UC 19-L	TR	TR	C-16-L	TR	UC 16-L	TR	TR	C 26 L	TR	UC 26 L	TR	TR
TIME (MINUTES)	(15)	(5)	(5)	(5)	(5)	(15)	(5)	(5)	(5)	(5)	(15)	(5)	(5)	(5)	(5)
TRACK LOCATION	OS-2	MAIN	MAIN	PASS TRK	OS-3	OS 3	MAIN	MAIN	PASS TRK	QM 1	QM 1	MAIN	MAIN	PASS TRK	QM-6
NUMBER OF RAILCARS	19	19	0	0	0	16	16	0	0	0	26	26	0	0	0

1400 1500

TIME IN HOURS →

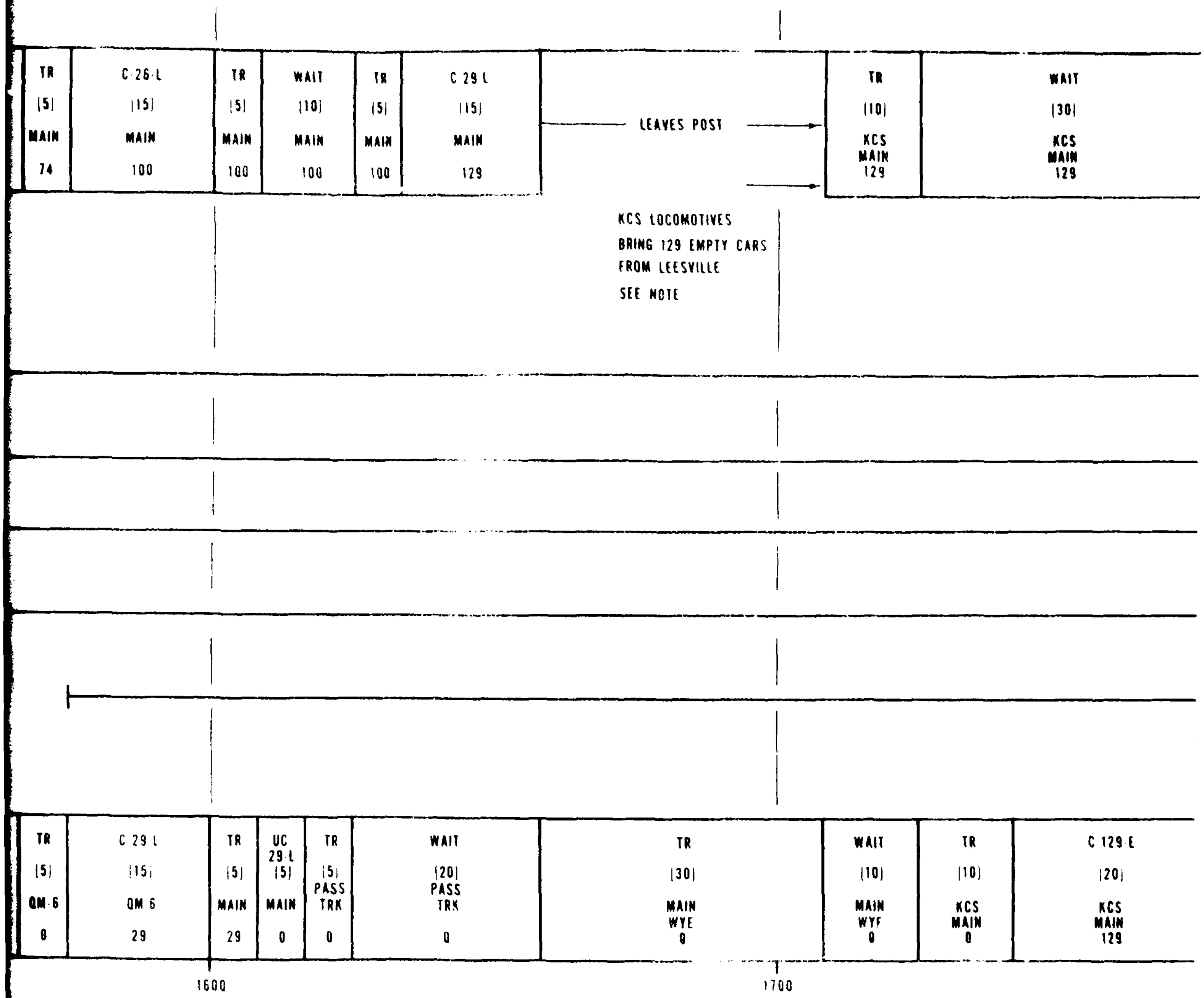


Figure 27. Rail Outloading Simulation.

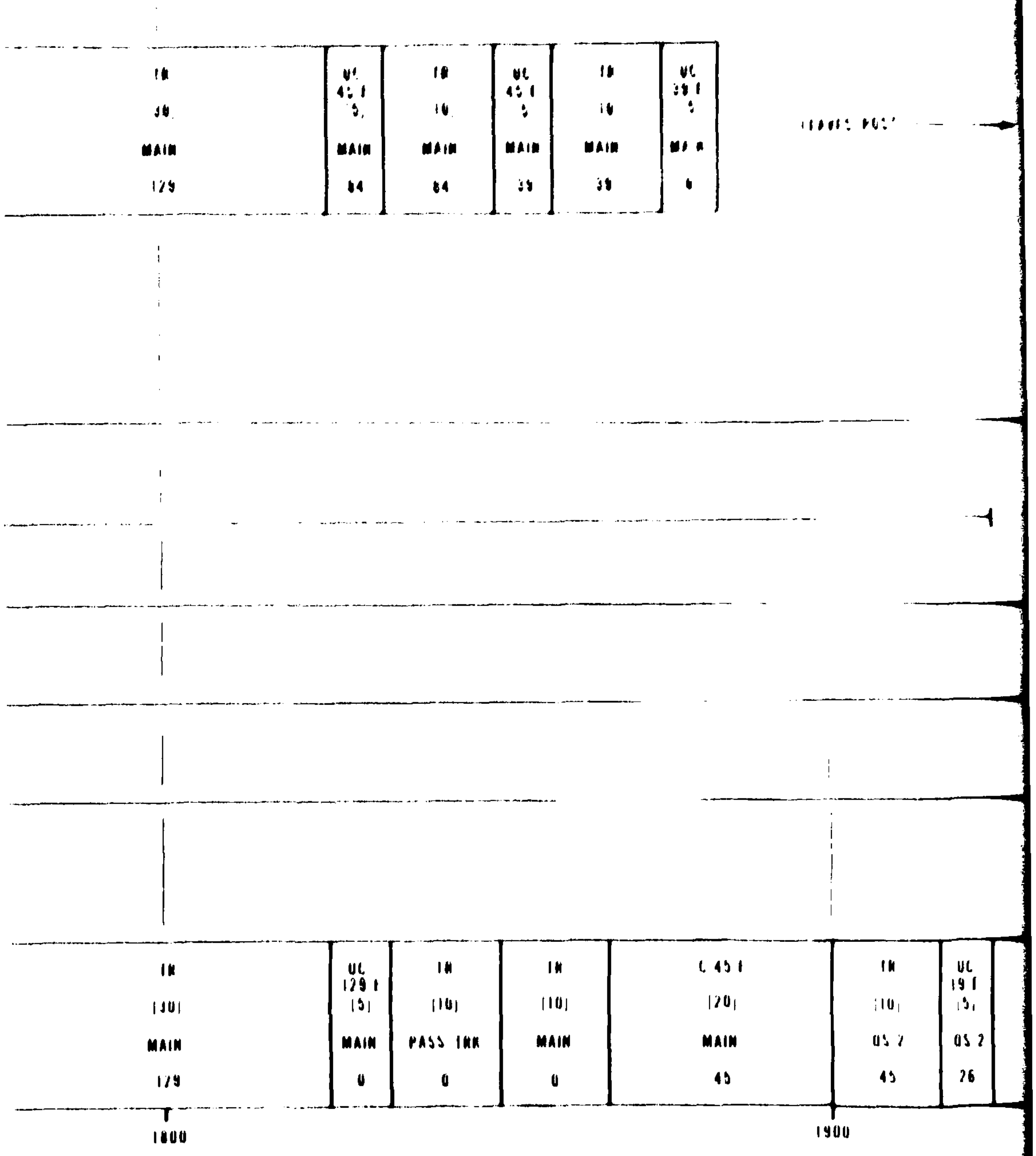
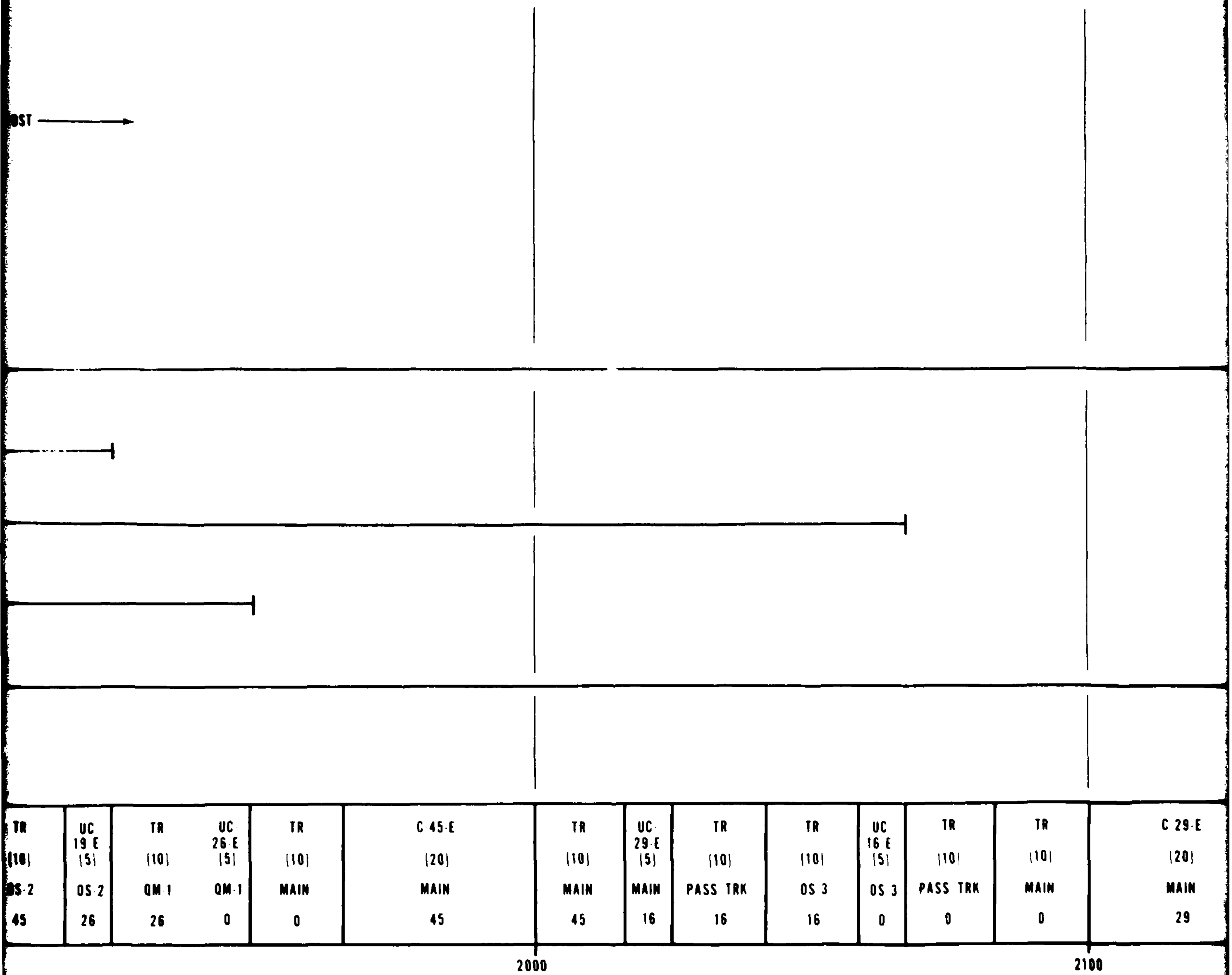
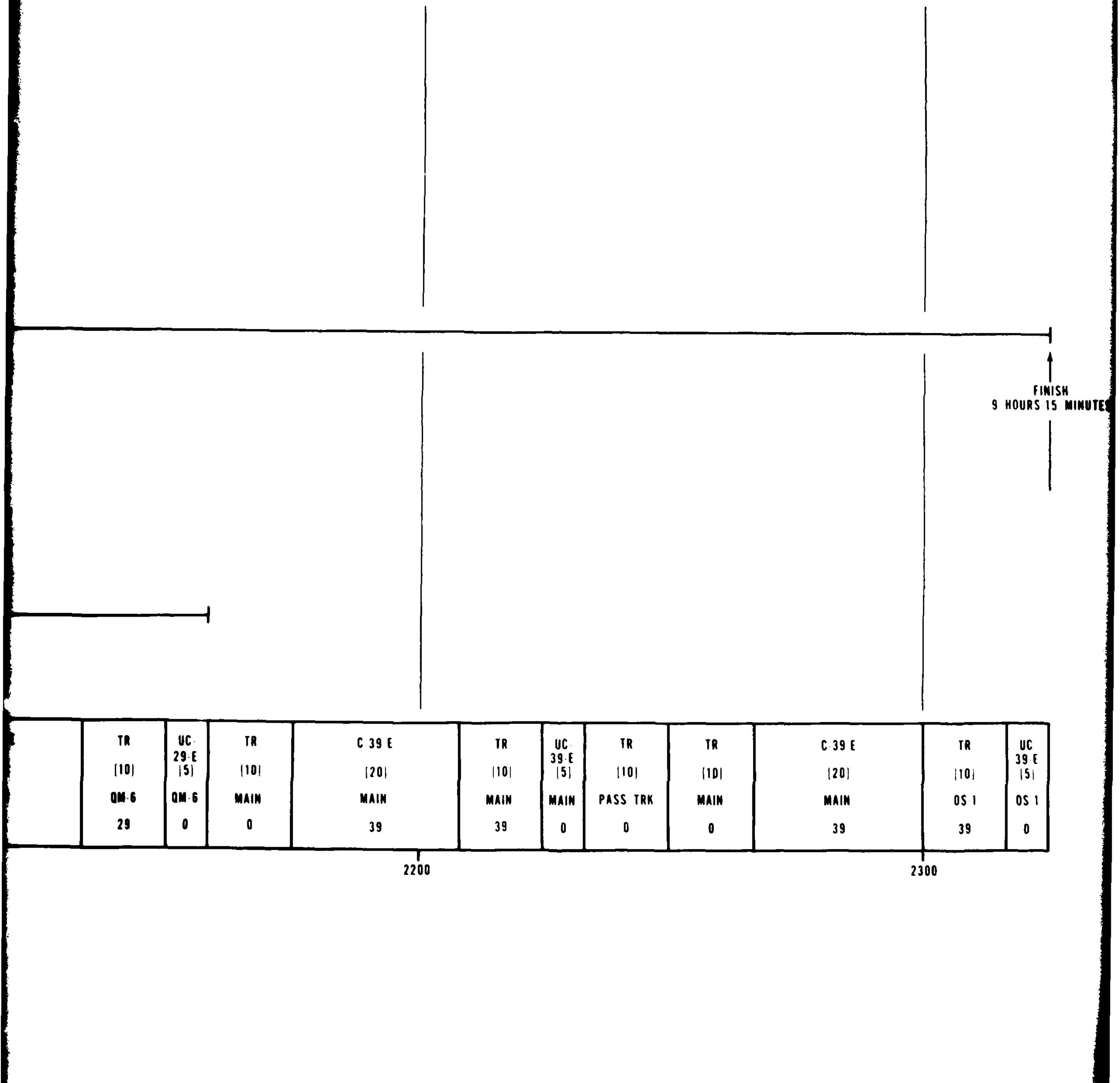


Figure 27. – Continued


OST
TR (10) OS-2 45
UC 19-E (5) OS-2 26
TR (10) QM-1 26
UC 26-E (5) QM-1 0
TR (10) MAIN 0
C-45-E (20) MAIN 45
TR (10) MAIN 45
UC 29-E (5) MAIN 16
TR (10) PASS TRK 16
TR (10) OS 3 16
UC 16-E (5) OS 3 0
TR (10) PASS TRK 0
TR (10) MAIN 0
C 29-E (20) MAIN 29
2000
2100

2


FINISH
9 HOURS 15 MINUTES
TR (10) QM-6 29
UC-29-E (5) QM-6 0
TR (10) MAIN 0
C 39 E (20) MAIN 39
TR (10) MAIN 39
UC-39-E (5) MAIN 0
TR (10) PASS TRK 0
TR (10) MAIN 0
C 39 E (20) MAIN 39
TR (10) OS 1 39
UC 39-E (5) OS 1 0
2200
2300

PLAN 4

NOTE: This is a simultaneous operation with the locomotives from Leesville and the switching engine on post starting their operations at 1500 hours.

Locomotives arrive from Leesville with no empty railcars

TRACK OPERATION

OS-1: C-39-L

MAIN: Wait

MAIN (at the passing track):

C-19-L
(39+19=58)

MAIN (north of 4th St): Wait

MAIN (at the passing track):

C-16-L
(58+16=74)

MAIN (north of 4th St): Wait

MAIN (at the passing track):

C-26-L
(74+26=100)

MAIN (north of 4th St): Wait

Switching locomotive

TRACK OPERATION

OS-2: C-19-L

MAIN (at the passing track):

UC-19-L

PASSING TRACK: Goes around the string

OS-3: C-16-L

MAIN (at the passing track):

UC-16-L

PASSING TRACK: Goes around the string

QM-1: C-26-L

MAIN (at the passing track):

UC-26-L

PASSING TRACK: Goes around the string

QM-6: C-29-L

MAIN (at the passing track):

UC-29-L

MAIN (at the passing track):

(100+29=129)

LEAVE POST

Locomotives arrive from Leesville with 129 empty railcars

KCS MAIN: (south of the wye): UC lead locomotive

KCS MAIN (north of the wye): wait

MAIN (at the passing track):

UC-45-E
(129-45=84)

MAIN (east of Miss. Ave):

UC-45-E
(84-45=39)

MAIN (west of Miss. Ave):

UC-39-E

LEAVE POST

PASSING TRACK: Waits

WYE (at the KCS MAIN): Waits

KCS MAIN: C-129-E

MAIN (at the passing track):

UC-129-E

PASSING TRACK: Goes around the string

MAIN (at passing track):

C-45-E

OS-2: UC-19-E
(45-19=26)

QM-1: UC-26-E

MAIN (east of Miss. Ave):

C-45-E

MAIN (at the passing track):

UC-29-E
(45-29=16)

PASSING TRACK: Goes around the string

OS-3: UC-16-E

PASSING TRACK: Goes around the string

MAIN (at passing track):

C-29-E

QM-6: UC-39-E

MAIN (west of Miss. Ave):

C-39-E

MAIN (at the passing track):

UC-39-E

PASSING TRACK: Goes around the string

MAIN (at the passing track):

C-39-E

OS-1: UC-39-E

FINISH

Total Time: 9 hours 15 minutes
Time Available for this Operation: 17 hours

As shown in the simulation, loading, blocking, and bracing are allowed 7 hours minimum during the daytime. Post crews should be able to meet *these deadlines. This procedure produces* 129 railcars per day. The switching sequences for all remaining plans are shown as follows:

PLAN 1

Locomotives arrive from Leesville with 64 empty railcars

↓

MAIN (west of Exchange Rd): UC-19-E
(64-19=45)

↓

PASSING TRACK: UC-45-E, switch ends, and C-45-E

↓

NORTH MAIN: UC-45-E

↓

MAIN (west of Exchange Rd): C-19-E

↓

PASSING TRACK: UC-19-E, switch ends, and C-19-E

↓

SOUTH MAIN: UC-19-E

↓

QM-6: C-29-L

↓

OS-3: C-16-L
(29+16=45)

↓

PASSING TRACK: UC-45-L, switch ends, and C-45-L

↓

MAIN (west of Exchange Rd): UC-45-L

↓

N MAIN: C-45-E

↓

OS-3: UC-16-E

↓

QM-6: UC-29-E

↓

OS-2: C-19-L

↓

N MAIN: UC -19-L

↓

S MAIN: C-19-E

↓

OS-2: UC-19-E

MAIN (west of Exchange Rd): C-45-L

PASSING TRACK: UC-45-L, switch ends, and C-45-L

N MAIN: C-19-L
(45+19=64)

LEAVE POST

Total Time: 5 hours 35 minutes

PLAN 2

Locomotives arrive from Leesville with no empty railcars

OS-2: C-47-L

PASSING TRACK: UC-47-L

OS-3: C-16-L

QM-6: C-29-L
(29+16=45)

PASSING TRACK: C-47-L
(45+47=92)

LEAVE POST

Locomotives arrive from Leesville with 92 empty railcars

MAIN (east of Miss. Ave): UC-47-E
(92-47=45)

MAIN (at the passing track): UC-45-E, switch ends, and C-45-E

QM-6: UC-29-E
(45-29=16)

OS-3: UC-16-E

MAIN (east of Miss. Ave): C-47-E

MAIN (at the passing track): UC-47-E, switch ends, and C-47-E

OS-2: UC-47-E

LEAVE POST

Total Time: 5 hours 30 minutes

PLAN 3

Locomotives arrive from Leesville with no empty railcars

↓

OS-2: C-19-L

↓

QM-1: C-26-L
(19+26=45)

↓

PASSING TRACK: UC-45-L

↓

OS-3: C-16-L

↓

QM-6: C-29-L
(16+29=45)

↓

PASSING TRACK: C-45-L
(45+45=90)

↓

LEAVE POST

Locomotives arrive from Leesville with 90 empty railcars

↓

MAIN (west of Miss. Ave): UC-45-E
(90-45=45)

↓

PASSING TRACK: UC-45-E, *switch ends,* and C-29-E

↓

QM-6: UC-29-E

↓

PASSING TRACK: C-16-E

↓

OS-3: UC-16-E

↓

MAIN (west of Miss. Ave): C-45-E

↓

PASSING TRACK: UC-26-E
(45-26=19)

↓

OS-2: UC-19-E

↓

PASSING TRACK: C-26-E

↓

QM-1: UC-26-E

↓

LEAVE POST

Total Time: 8 hours 25 minutes

PLAN 5

NOTE: The symbols used in the switching sequence are:

C-16-L means that the locomotive couples with 16 loaded railcars.

OS-1:

MAIN (near Miss. Ave): means that the locomotive goes from OS-1 to a point on the main track near Miss. Ave.

Three locomotives coupled together in a unit arrive from Leesville with no empties

OS-1: C-39-L

MAIN (near Miss. Ave): Wait

MAIN (at the passing track):

C-19-L
(39+19=58)

MAIN (west of Miss. Ave): Wait

MAIN (at the passing track):

C-16-L
(58+16=74)

MAIN (west of Miss. Ave): Wait

MAIN (at the passing track):

C-26-L
(74+26=100)

Switch engines on post

OS-2: C-19-L

MAIN (at the passing track):

UC-19-L

PASSING TRACK: Go around the string

OS-3: C-16-L

MAIN (at the passing track):

UC-16-L

PASSING TRACK: Go around the string

QM-1: C-26-L

MAIN (at the passing track):

UC-26-L

PASSING TRACK: Go around the string

MAIN (west of Exchange Rd): Wait

MAIN (at the passing track):

C-16-L
(100+16=116)

MAIN (west of Exchange Rd): Wait

MAIN (at the passing track):

C-29-L
(116+29=145)

LEAVE POST

Empty railcars from Leesville are brought on post by KCS locomotives

MAIN (near OS-2):

UC-103-E
then wait

QM-3: C-16-L

MAIN (at the passing track):

UC-16-L

PASSING TRACK: Go around the string

QM-6: C-29-L

MAIN (at the passing track):

UC-29-L

PASSING TRACK: Wait

Switch engines wait on the PX Spur while the empties pass

MAIN (west of Exchange Rd): Wait

PASSING TRACK: UC-42-E

PASSING TRACK (north end):

C-42-E

QM-1: UC-26-E
(42-26=16)

QM-3: UC-16-E

MAIN (north end of passing track):

C-45-E

QM-6: UC-29-E
(45-29=16)

OS-3: UC-16-E

MAIN (at the passing track):

UC-45-E
(103-45=58)

MAIN (west of Miss. Ave): Stop

OS-1: UC-39-E
(58-39-19)

OS-2: UC-19-E

FINISH

Total Time: 7 hours 15 minutes

PLAN 6

Two units of locomotives arrive from Leesville with no empty railcars. One unit oi locomotives waits out of the way on the North Main

↓

OS-1: C-39-L

↓

MAIN (west of Miss. Ave): Waits

↓

MAIN (at the passing track):

C-35-L
(39+35=74)

↓

LEAVES POST

Unit of locomotives at the N Main

↓

QM-1: C-26-L

↓

MAIN (near Miss. Ave): Waits

↓

MAIN (at the passing track):

C-16-L
(26+16=42)

Switch engine

↓

OS-2: C-19-L

↓

OS-3: C-16-L
(19+16=35)

↓

MAIN (at the passing track):

UC-35-L

↓

PASSING TRACK: Goes around the string

↓

QM-3: C-16-L

↓

MAIN (at the passing track):

UC-16-L

↓

PASSING TRACK: Goes around the string

MAIN (near Miss. Ave): Waits

MAIN (at the passing track):

C-29-L
(42+29=71)

MAIN (west of Miss. Ave): Waits

MAIN (at the passing track):

C-22-L
(71+22=93)

LEAVES POST

Locomotive from Leesville brings in 167 empties

MAIN (west of Exchange Rd):

UC-39-E
(167-34=128)

MAIN (east of Exchange Rd):

UC-35-E
(128-35=93)

MAIN (east of Miss. Ave):

UC-51-E
(93-51=42)

MAIN (at the passing track):

UC-42-E

QM-6: C-29-L

MAIN (at the passing track):

UC-29-L

PASSING TRACK: Goes around the string

S MAIN: C-22-L

MAIN (at the passing track):

UC-22-L

PASSING TRACK: Waits

MAIN (east of Miss. Ave):

C-51-E

PASSING TRACK: Goes around the string

MAIN (at the passing track):

C-42-E

QM-1: UC-26-E
(42-26=16)

QM-3: UC-16-E

PASSING TRACK: Waits

MAIN (west of Miss. Ave):

C-35-E

MAIN (at the passing track):

UC-35-E

PASSING TRACK: Goes around the string

MAIN (at the passing track):

C-35-E

OS-2: UC-19-E
(35-19=16)

OS-3: UC-16-E

MAIN (at the passing track):

UC-51-E

PASSING TRACK: Goes around the string

MAIN (at the passing track):

C-51-E

QM-6: UC-29-E
(51-29=22)

S MAIN: UC-22-E

MAIN (west of Exchange Rd):

C-39-E

OS-1: UC-39-E

Total Time: 7 hours 15 minutes

PLAN 7

Tow units of locomotives arrive from Leesville with no empty railcars

UNIT #1

OS-1: C-39-L

N MAIN:

C-21-L
(39+21=60)

MAIN (west of Miss. Ave): Stops

MAIN (near the wye):

C-35-L
(60+35=95)

LEAVES POST

UNIT #2

OS-2: C-19-L

PASSING TRACK:

UC-19-L

OS-3: C-16-L

PASSING TRACK:

C-19-L
(16+19=35)
UC-35-L, switches ends, and
C-35-L

MAIN (near the wye):

UC-35-L

S MAIN: C-24-L

PASSING TRACK:

UC-24-L

QM-1: C-26-L

PASSING TRACK:

C-24-L, UC-50-L

QM-6: C-29-L

N MAIN: UC-29-L

QM-3: C-16-L

PASSING TRACK:

C-50-L
(16+50=66)

N MAIN:

C-29-L
(66+29=95)

LEAVES POST

Two units of locomotives arrive from Leesville, each unit has 95 empty railcars

UNIT #1

MAIN (east of Exchange Rd):

UC-26-E
(95-26=69)

MAIN (east of Miss. Ave):

UC-24-E
(69-24=45)

PASSING TRACK:

UC-45-E, switches ends, and C-16-E

QM-3: UC-16-E

PASSING TRACK:

C-29-E

UNIT #2

MAIN (west of LA Hwy 467): Waits

QM-6: UC-29-E

MAIN (east of Miss. Ave):

C-24-E

MAIN (east of Exchange Rd):

C-26-E
(24+26=50)

PASSING TRACK:

UC-50-E, switches ends, and C-24-E

S MAIN: UC-24-E

PASSING TRACK: C-26-E

QM-1: UC-26-E

N MAIN (point on the wye): Waits

MAIN (east of Miss. Ave):

C-39-E

OS-1: UC-39-E

MAIN (east of Exchange Rd):

UC-21-E
(95-21=74)

PASSING TRACK: (north of 4th St):

UC-39-E
(74-39=35)

PASSING TRACK (south of 4th St):

UC-35-E, switches ends, and C-16-E

OS-3: UC-16-E

PASSING TRACK: Waits

MAIN (south of the wye):

C-21-E

N MAIN: UC-21-E

LEAVES POST

PASSING TRACK: C-19-E

OS-2: UC-19-E

MAIN (east of Exchange Rd):

C-21-E

MAIN (south of the wye):

UC-21-E

LEAVES POST

Total Time: 11 hours 10 minutes

PLAN 8

Two switching locomotives and two main line locomotives arrive from Leesville with no empty railcars, and the main line locomotives wait on the main, west of LA Hwy 467, for the switching locomotives to bring out the loaded railcars.

SWITCH ENGINE #1

OS-2: C-19-L

N MAIN: Turns around

MAIN (west of LA Hwy 467):

UC-19-L

N MAIN (southwest leg of wye): waits

PASSING TRACK: C-20-L

N MAIN: Turns around

MAIN (west of Exchange Rd):

UC-20-L

N MAIN (southwest leg of wye): waits

OS-1: C-19-L

N MAIN: Turns around

SWITCH ENGINE #2

N MAIN: C-21-L

MAIN (west of LA Hwy 467):

UC-21-L

MAIN (southwest leg of wye): waits

PASSING TRACK: C-15-L

N MAIN: Turns around

MAIN (east of LA Hwy 467):

UC-15-L

N MAIN (southwest leg of wye): waits

OS-1: C-20-L

N MAIN: Turns around

MAIN (east of Exchange Rd):

UC-20-L

N MAIN (southwest leg of wye): waits

MAIN (west of Miss. Ave):

UC-19-L

FIRST TRAIN FINISHED - 114 railcars

SWITCH ENGINE #1

MAIN (southwest leg of wye): Waits

QM-6: C-9-L

QM-1: C-6-L
(9+6=15)

N MAIN: Turns around

MAIN (east of LA Hwy 467):

UC-15-L

N MAIN (southwest leg of wye): Waits

S MAIN: C-4-L

OS-3: C-16-L
(4+16=20)

N MAIN: Turns around

MAIN (east of Exchange Rd):

UC-20-L

N MAIN (southwest leg of wye): Waits

SWITCH ENGINE #2

QM-6: C-20-L

N MAIN: Turns around

MAIN (west of LA Hwy 467):

UC-20-L

MAIN (southwest leg of wye): Waits

QM-1: C-20-L

N MAIN: Turns around

MAIN (west of Exchange Rd):

UC-20-L

N MAIN (southwest leg of wye):
Waits

S MAIN: C-20-L

N MAIN: Turns around

QM-4: C-16-L

N MAIN: Turns around

MAIN (east of Miss. Ave):

UC-16-L

MAIN (west of Miss. Ave):

UC-20-L

N MAIN (southwest leg of wye): Waits

SECOND TRAIN FINISHED - 111 railcars

After the second train leaves post, the switch engines go to the KCS main and bring in 111 empties, with the main line locomotives coupled to the rear of the empties so that the empties can be shoved into the switch engines as needed to a point just west of Miss. Ave.

SWITCH ENGINE #1

MAIN (west of Miss. Ave):

UC-91-E

N MAIN: Turns around

S MAIN: UC-20-E

N MAIN (southwest leg of wye): Waits

MAIN (west of Miss. Ave):

C-20-E

N MAIN: Turns around

SWITCH ENGINE #2

MAIN (west of Miss. Ave):

UC-111-E

N MAIN (southwest leg of wye): Waits

MAIN (west of Miss. Ave):

C-20-E

N MAIN: Turns around

OS-3: UC-16-E
(20-16=4)

S MAIN: UC-4-E

N MAIN (southwest leg of wye): Waits

QM-2: UC-20-E

N MAIN (southwest leg of wye): Waits

MAIN (west of Miss. Ave):

C-15-E

N MAIN: Turns around

QM-6: UC-9-E
(15-9=6)

QM-1: UC-6-E

N MAIN (southwest leg of wye): Waits

MAIN (west of Miss. Ave):

C-20-E

N MAIN: Turns around

QM-6: UC-20-E

N MAIN (southwest leg of wye): Waits

MAIN (west of Miss. Ave):

C-16-E

N MAIN: Turns around

QM-3: UC-16-E

N MAIN (southwest leg of wye): Waits

The main line locomotives leave post and the operation is repeated to bring in 114 empty railcars

SWITCH ENGINE #1

MAIN (west of Miss. Ave):

UC-95-E
(114-95=19)

N MAIN: Turns around

SWITCH ENGINE #2

MAIN (west of Miss. Ave):

UC-114-E

N MAIN (southwest leg of wye): Waits

OS-2: UC-19-E

N MAIN (southwest leg of wye): Waits

MAIN (west of Miss. Ave):

C-15-E

N MAIN: Turns around

PASSING TRACK: UC-15-E

N MAIN (southwest leg of wye): Waits

MAIN (west of Miss. Ave):

C-19-E

N MAIN: Turns around

OS-1: UC-19-E

MAIN (west of Miss. Ave):

C-20-E

N MAIN: Turns around

PASSING TRACK: UC-20-E

N MAIN (southwest leg of wye):
Waits

MAIN (west of Miss. Ave):

C-20-E

N MAIN: Turns around

OS-1: UC-20-E

N MAIN (southwest leg of wye):
Waits

MAIN (west of Miss. Ave):

C-21-E

MAIN (near 4th St): Stops

N MAIN: UC-21-E

Total Time: 9 hours 10 minutes

PLAN A

Loading Sites	Empty Storage	Loaded Storage
(20 cars) OS-1	(40 cars) S MAIN	(26 cars) QM-1
(19 cars) OS-2	(44 cars) N MAIN	(26 cars) QM-2
(16 cars) OS-3	(84 cars)	(16 cars) QM-3
(29 cars) QM-6		(16 cars) QM-4
(84 cars)		(84 cars)

Switching engines move loaded cars from loading sites to loaded storage

SWITCH ENGINE #1

↓
OS-3: C-16-L
↓
QM-3: UC-16-L
↓
OS-1: C-20-L
↓
QM-1: UC-20-L
↓
S MAIN: C-24-E
↓
S MAIN (south of LA Ave): C-5-E (24+5=29)
↓
QM-6: UC-29-E
↓
S MAIN: C-11-E
↓
OS-3: UC-11-E

SWITCH ENGINE #2

↓
OS-2: C-19-L
↓
QM-2: UC-19-L
↓
QM-6: C-29-L
↓
QM-4: UC-16-L (29-16=13)
↓
QM-1: UC-6-L (13-6=7)
↓
QM-2: UC-7-L
↓
N MAIN: C-21-E
↓
OS-1: UC-20-E (21-20=1)
↓
N MAIN: C-23-E (1+23=24)
↓
OS-2: UC-19-E (24-19=5)
↓
OS-3: UC-5-E

Total Time: 4 hours 40 minutes - This operation had to be completed in 5 hours or less.

Now, the main line locomotives must pick up the loaded cars and deliver the empty cars in the next 7 hours.

QM-3: C-16-L

QM-4: C-16-L
(16+16=32)

PASSING TRACK: UC-32-L

QM-1: C-26-L

QM-2: C-26-L
(26+26=52)

PASSING TRACK: C-32-L
(52+32=84)

LEAVE POST

Main line locomotives bring 84 empty railcars from Leesville; switch engines wait on the main east of the PX spur; the main line locomotives uncouple and pull into the PX spur; then the switch engines couple with the 84 empties and pull them past the PX spur so that the main line locomotives can come onto the main, couple with the rear of the string of empties, and shove them into place for the switch engines as needed.

SWITCH ENGINE #1

MAIN (near passing track):
UC-84-E

N MAIN: Waits

SWITCH ENGINE #2

MAIN (near passing track):
UC-44-E
(84-44=40)

PASSING TRACK: UC-40-E, switches ends, and C-40-E

S MAIN (south of LA Ave):
UC-16-E
(40 -16=24)

S MAIN (north of LA Ave):
UC-24-E

The main line engines now push the 44 empties into the N Main.

N MAIN (north of Magazine Rd):

UC-23-E

N MAIN (south of Magazine Rd):

UC-21-E

Total Time: 3 hours 50 minutes - This operation had to be completed in 7 hours or less.

PLAN B

Loading Sites	Empty Storage	Loaded Storage
(19 Railcars) OS-2	(29 Railcars) S MAIN	(26 Railcars) QM-1
(16 Railcars) OS-3	(19 Railcars) N MAIN	(22 Railcars) QM-2
(29 Railcars) QM-6	(16 Railcars) QM-4	(16 Railcars) QM-3
(64 Railcars)	(64 Railcars)	(64 Railcars)

SWITCHING ENGINES MOVE LOADED CARS FROM LOADING SITES TO LOADED STORAGE

SWITCH ENGINE #1

OS-3: C-16-L
↓
QM-3: UC-16-L
↓
QM-6: C-29-L
↓
QM-1: UC-26-L
(29-26=3)
↓
QM-2: UC-3-L
↓
N MAIN: C-19-E
↓
OS-2: UC-19-E
↓
QM-2: C-22-L
↓
PASSING TRACK: UC-22-L
↓
QM-1: C-26-L

SWITCH ENGINE #2

OS-2: C-19-L
↓
QM-2: UC-19-L
↓
S MAIN: C-24-E
↓
S MAIN (south of LA Ave):
C-5-E
(24+5=29)
↓
QM-6: UC-29-E
↓
QM-4: C-16-E
↓
OS-3: UC-16-E
↓
QM-3: C-16-L
↓
PASSING TRACK: C-22-L, UC-38-L (now, main line locomotives pick up these cars)

PASSING TRACK: UC-26-L
(Now, main line locomotives pick up these cars and leave post with 64 total)

Total Time: 4 hours 10 minutes

Main line locomotives from Leesville bring 64 empty railcars and the switch engines meet them at the KCS main.

Switch engines #1 and #2 are coupled together.

KCS MAIN: C-64-E

MAIN (between OS-1 and Miss. Ave): UC-19-E
(64-19=45)

PASSING TRACK: UC-45-E

Now, the switch engines uncouple from each other.

SWITCH ENGINE #1	SWITCH ENGINE #2
PASSING TRACK: Goes around string C-16-E	PASSING TRACK: Waits
QM-4: UC-16-E	PASSING TRACK: Goes around string, C-29-E
MAIN (between OS-1 and Miss. Ave): C-19-E	S MAIN (south of LA Ave): UC-5-E (29-5=24)
PASSING TRACK: UC-19-E, switches ends, and C-19-E	S MAIN (north of LA Ave): UC-24-E
N MAIN: UC-19-E	

Time Required: 4 hours no minutes, the available time for this operation is 7 hours.

PLAN C

Loading Sites	Empty Storage
(39 Railcars) OS-1	(26 Railcars) QM-1
(19 Railcars) OS-2	(26 Railcars) QM-2
(16 Railcars) OS-3	(16 Railcars) QM-3
(29 Railcars) QM-6	(16 Railcars) QM-4
(24 Railcars) S MAIN	(21 Railcars) N MAIN
	*(22 Railcars) N MAIN

Two switch engines feed the loaded cars to main line locomotives at the main beside the passing track. After coupling a string, the main line locomotives pull the string out of the way and wait for another string to be delivered by a switch engine. The main line units for the second train wait out of the way on the wye at the N Main.

SWITCH ENGINE #1

OS-3: C-16-L

MAIN (at the passing track):

UC-16-L
(Main line locomotive picks up these cars and moves out of the way near OS-1)

PASSING TRACK: Goes around string

S MAIN: C-24-L, then waits

MAIN (at the passing track):

UC-24-L

PASSING TRACK: Goes around string

SWITCH ENGINE #2

OS-2: C-19-L

MAIN (at the passing track):

UC-19-L

PASSING TRACK: Goes around string

QM-6: C-29-L, then waits

*Stored north of Magazine Road.

Now, the first train leaves post with 59 loaded cars.

QM-1: C-3-E

MAIN (at the passing track):

UC-29-L

PASSING TRACK: Goes around string, waits

Now, the second train leaves post with 68 loaded cars, after having picked up 39 cars at OS-1 immediately following departure of first train.

QM-2: C-26-E
(3+26=29)

QM-6: UC-29-E

QM-3: C-16-E

OS-3: UC-16-E

QM-4: C-16-E

OS-2: UC-16-E

N MAIN: C-21-E

N MAIN (north of Magazine Rd):

C-22-E
(21+22=43)

OS-1: UC-39-E
(43-39=4

QM-1: C-23-E
(4+23=27)

S MAIN: UC-24-E
(27-24=3)

OS-2: UC-3-E

Total Time: 4 hours 45 minutes

Main line locomotives from Leesville bring 69 empty railcars and the switch engines meet them at the KCS main.

Switch engines are coupled together

KCS MAIN: C-69-E

MAIN (at the wye): UC-43-E
(69-43=26)

PASSING TRACK: UC-29-E, go around the string, and C-29-E

In the meantime, the main line locomotives have shoved the 43 empty railcars into the N Main, and additional main line locomotives have brought 58 more empty railcars from Leesville. All the main line locomotives get out of the way at the northwest leg of the wye.

Now the switch engines uncouple from each other

SWITCH ENGINE #1	SWITCH ENGINE #2
MAIN (at the wye): C-32-E	
PASSING TRACK: UC-32-E, goes around string, and C-16-E	
QM-3: UC-16-E	PASSING TRACK: C-16-E
	QM-4: UC-16-E
MAIN (at the wye): C-26-E	
QM-2: UC-26-E	

Total Time: 4 hours 10 minutes - This operation had to be finished in 7 hours or less.

PLAN D

Loading Sites	Empty Storage
(19 cars) OS-2	(26 cars) QM-1
(16 cars) OS-3	(26 cars) QM-2
(29 cars) QM-6	(16 cars) QM-3
(24 cars) S MAIN	(16 cars) QM-4
	(4 cars) N MAIN

Main line locomotives arrive from Leesville to pick up 88 loaded cars. The switch engines place the cars at the passing track, where the main line locomotives couple and pull out of the way while awaiting the next string. First, the locomotives pick up 29 loaded cars from QM-6.

SWITCH ENGINE #1	SWITCH ENGINE #2
OS-3: C-16-L	OS-2: C-19-L, waits
MAIN (at the passing track): UC-16-L	
PASSING TRACK: Goes around string	
	MAIN (at the passing track): UC-19-L
S MAIN: C-24-L	
	PASSING TRACK: Goes around string
MAIN (at the passing track): UC-24-L	
	QM-2: C-26-E
PASSING TRACK: Waits	

Now the main line locomotive leaves post with 88 loaded cars

SWITCH ENGINE #1	SWITCH ENGINE #2
	OS-2: UC-19-E (26-19=7)
QM-1: C-26-E	

QM-6: UC-26-E	S MAIN: UC-7-E
QM-3: C-16-E	N MAIN: C-4-E
OS-3: UC-16-E	QM-6: UC-3-E (4-3=1)
QM-4: C-16-E	
S MAIN: UC-16-E	S MAIN: UC-1-E

Total Time: 4 hours 25 minutes
The available time for this operation is 5 hours

Main line locomotives bring 88 empty railcars from Leesville and the switch engines go after them.

KCS Main Line: C-88-E

MAIN (east of Exchange Rd): UC-30-E
(88-30=58)

MAIN (east of Miss. Ave): UC-16-E
(58-16=42)

PASSING TRACK: UC-42-E

Switch engines uncouple from each other

SWITCH ENGINE #1	SWITCH ENGINE #2
PASSING TRACK: Switches ends, C-16-E	PASSING TRACK: Waits
QM-4: UC-16-E	PASSING TRACK: Switches ends, C-26-E
MAIN (east of Miss. Ave): C-16-E	QM-2: UC-26-E
QM-3: UC-16-E	MAIN (east of Exchange Rd): C-30-E

PASSING TRACK: C-4-E

N MAIN: UC-4-E

PASSING TRACK: UC-30-E

PASSING TRACK: Switches ends, C-26-E

QM-1: UC-26-E

Total Time: 4 hours 45 minutes

APPENDIX C

RAILCAR SUPPLY

The following trends in flatcar supply are now operative and have been since the development of modern piggyback service in the mid-1950's:

1. The size of the flatcar fleet has been rising, both absolutely and relative to the size of the car fleet as a whole. This gain has been confined to specialized cars; for example, trailer-on-flatcar (TOFC), container-on-flatcar (COFC), bilevel, trilevel, and bulkhead flatcars.

2. The size of the general-purpose flatcar fleet has decreased, though average length and capacity have increased.

3. A majority of all flatcars are owned by car companies, not by the railroads. This provides more flexibility in assignment, which results in improved utilization. Fewer idle cars are available for short-notice use than there would be if each railroad had to maintain an adequate supply for its own needs.

Considering these trends, plus the size of the various components of the specialized flatcar fleet, and the blocking and bracing requirements of the various types of equipment to be shipped by rail, it does not appear prudent to express an installation's needs and outloading plan using only general-purpose flats. The TOFC fleet, especially, is now large enough to make it likely that military requirements can be accommodated (Table IV). The COFC fleet has also expanded to the point that it could carry most of the military's container movements, especially if one considers that COFC cars are used almost exclusively for import/export movements, which are likely to be greatly disrupted in a mobilization period.

Accordingly, that portion of the outloading comprised of vans or containers should be planned for movement on TOFC cars. If the movement is to a port where ocean shipment will be by other than RORO vessel, the use of COFC cars should be discussed, though one cannot be confident of obtaining COFC cars in the quantity desired without disrupting civilian container movements.

Other cars in the specialized flatcar fleet generally are assigned to specific services or to a carpool for one shipper's exclusive use. Therefore, while those cars can reduce blocking and bracing and should be requested at the time of a specific move to the extent they can be employed profitably,

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TABLE IV
TRAILER TRAIN COMPANY FLEET

Trailer Train Company ownership of selected car types as contained in the April 1976 Official Railway Equipment Register. Trailer Train owns in excess of 95 percent of total US ownership of TOFC, COFC, and auto rack cars.

Type	Reporting Marks	Quantity
TOFC	*TTX	29,661
	TTAX	5,033 (see also COFC cars)
	GTTX	2,287
	LTTX	1,876
	XTTX	733
	Total	39,580

These cars each have a capacity of two 40-foot (nominal length) trailers. Some can handle one 40-foot and one 45-foot trailer. The XTTX cars also have the capability of transporting three 28-foot trailers.

Type	Reporting Marks	Quantity
COFC	TTAX	5,003 (see also TOFC cars)
	TTCX	708
	Total	5,741

Each car can handle four 20-foot container equivalents. Note that the TTAX cars can handle either containers or trailers and so are counted in both TOFC and COFC totals.

Type	Reporting Marks	Quantity
Bilevels	TTBX	4,333
	BTTX	2,776
	Total	7,109
Trilevels	TTKX	6,133
	RTTX	3,500
	KTTX	2,685
	TTRX	2,196
	ETTX	796
	Total	15,310

*Definitions of Trailer Train Company's reporting marks (all are flatcars)
TTX - Equipped with hitches and bridge plates for the transportation of trailers.
TTAX - Equipped with movable foldaway container pedestals, knock-down hitches and bridge plates for transporting trailers or containers or combinations of both. (A = all).
GTTX - Equipped with hitches and bridge plates for the transportation of trailers built by General American Transportation Corporation. (G = General)
LTTX - Low deck (2' 8" or 2' 9" instead of 3' 6"), equipped with hitches and bridge plates. (L = Low)
XTTX - Equipped with four hitches and bridge plates for the transportation of two trailers; one 45-foot and one 40-foot or three 28-foot trailers.
TTCX - Equipped with movable foldaway container pedestals for transporting containers. (C = Container)
BTTX - Equipped with bilevel auto racks furnished by member railroads. (B = bilevel)
TTBX - Length 89' 4" or over, equipped with bilevel auto racks furnished by member railroads. (B = bilevel)
TTKX - Length 89' 4" or over, equipped with hinged end trilevel auto racks furnished by member railroads.
RTTX - Length 89' 4" or over, equipped with fixed trilevel auto racks furnished by member railroads.
KTTX - Equipped with hinged end trilevel auto racks furnished by member railroads.
TTRX - Equipped with fixed trilevel auto racks furnished by member railroads.
ETTX - Equipped with fully enclosed trilevel auto racks furnished by member railroads. (E = enclosed).

the possibility of obtaining them is too unlikely to base outloading requirement on their use.

Factors affecting the use of specialized flatcars include:

1. First priority for use of general-purpose flats should be to load tracked vehicles and nonstandard wheeled vehicles; for example, artillery.

2. First priority for requesting specialized flats should be for TOFC and COFC cars to load vans and containers, which require very extensive blocking and bracing to move on general-purpose cars.

3. TOFC and COFC cars require no blocking and bracing.

4. Bilevel and trilevel flats will require heavier chains and possibly different hooks to handle other than commercial specification vehicles.

5. Chain tiedown flats may require heavier chains depending on the loads for which they were designed.

6. Where TOFC cars must be loaded by ramp rather than by side or overhead loading, the number of cars at a ramp should be limited to about 10 because of the delay involved in backing the trailers down the length of the cars and returning with the tractor.

7. Where sufficient suitable aprons and MHE are available, it may be desirable to load containers directly onto COFC cars rather than to place them on bogies and use TOFC cars.

8. If COFC or TOFC flats are not available, some blocking and bracing time and expense can be saved by using bulkhead flatcars to carry containers.

9. Bilevel and trilevel cars require, obviously, bilevel and trilevel ramps or other equipment as indicated in TM 55-625.

10. TOFC, COFC, bilevel, and trilevel cars average 89 feet long. TOFC cars can handle two 40-foot trailers or one 40-foot and one 45-foot trailer. COFC cars can handle four 20-foot container equivalents. Rack cars can accommodate four to seven vehicles per deck, depending on vehicle length and the number of tiedown chain sets.

11. Tracks used to store or load cars over 65 feet long should be reachable without going through curves exceeding 10-degree curvature; tracks used for cars between 55 and 65 feet should be reachable without going through curves exceeding 12-degree curvature.

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